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The Flora of Plum Island Essex County, Massachusetts

by

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Cover: Beach Plum (Prunus maritima) by Lisa Bandazian.

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Abstract

Plum Island is an eight mile long (12.8 km) barrier island located at the southern tip of the Gulf of Maine in Essex County, Massachusetts. It covers approximately 3,644 acres (1,475 ha) including such varied habitats as sand dunes, salt and fresh water marshes, and uplands. The northern third of the island is densely populated with many private homes and cottages. The southern two-thirds of the island is included in the Parker River National Wildlife Refuge and a Massachusetts State Park. This is one of the largest semi-natural barrier beach dune systems north of Cape Cod. The relatively undisturbed southern portion of the island exhibits the classical physiographic features and vegetation zones of a barrier beach dune system. An annotated list of vascular plants was produced from plant collections made by the author during 1977 through the spring of 1979, herbarium records, and literature sources. Some 514 taxa have been recorded as occurring on the island.

KEY WORDS: barrier beach, sand dunes, flora, Plum Island, coastal vegetation.

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THE FLORA OF PLUM ISLAND

ESSEX COUNTY, MASSACHUSETTS

by

Mark J. McDonnell[1]

INTRODUCTION

Plum Island is an eight mile long (12.8 km) barrier island located at the southern tip of the Gulf of Maine in Essex Co., Massachusetts. It is bordered on the north by the mouth of the Merrimack River and on the south by Ipswich Bay (Fig. 1). The northern third of the island is densely populated, with many private homes and cottages. The dunes at this end of the island have been so altered that they scarcely resemble their once natural grandeur. Due to the foresight of early conservationists the southern two-thirds of the island has remained relatively natural. The Parker River National Wildlife Refuge now includes much of this area except for the extreme southern tip, which is a state park. Because of this extensive preservation effort, Plum Island is one of the largest permanently protected semi-natural barrier islands north of Cape Cod. Management techniques have helped stabilize the dunes, and damage done by early land misuse has begun to heal. The dunes at this end of the island range from thirty to fifty feet in height, forming a dynamic ecosystem unique in its composition of plant and animal populations. With increasing development pressures on coastal dunes all along the Atlantic Coast, Plum Island provides one of the few remaining habitats suitable for many plants and animals which require this coastal environment.

Plum Island is well known for the quantity and variety of bird life it harbors (Griscom, 1955). Consequently this portion of its fauna is well documented. Even though the island is located in a region which has produced many notable botanists it has been virtually ignored botanically. Until the late 1950's there had been no attempt to document the vascular flora of the island. During 1956 and 1957 Stuart K. Harris made a substantial effort to compile a list of plants growing on the island for his Flora of Essex County (Harris, 1975). Over the past three years, as part

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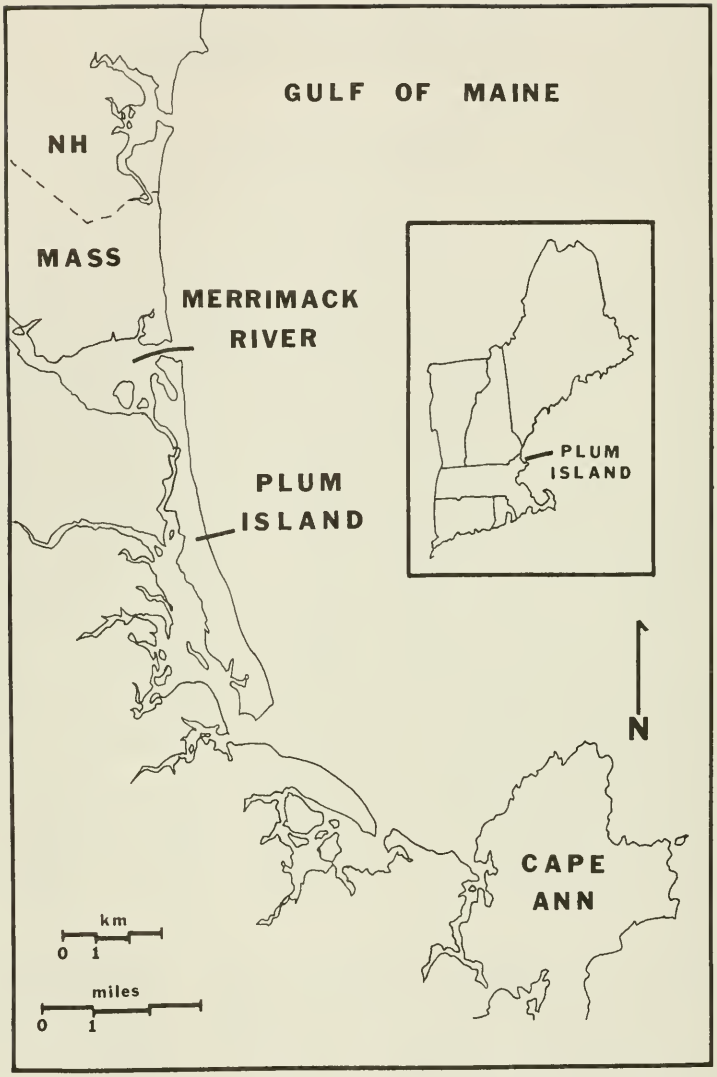

Figure 1. A map showing the location of Plum Island.

of my Master's Thesis (McDonnell, 1979), I have documented the flora of Plum Island based on field studies, herbarium specimens, and literature sources. It is hoped that this flora will provide a stimulus, as well as a basis, for future study. Information concerning corrections or additions to the flora will be greatly appreciated by the author.

PHYSICAL FEATURES

Plum Island covers approximately 3,644 acres (1,475 ha). It varies in width from one quarter (0.4 km) to three quarters of a mile (1.2 km) (Fig. 2). The upland areas cover some 1,680 acres (680 ha) including Cross Farm Hill, Stage Island, Bar Head, and the dunes. The freshwater habitats on the island cover approximately 375 acres (152 ha). Most of which are included in North, South, and Stage Island Pools, all of which are artifical impoundments created by Parker River National Wildlife Refuge personnel (PRNWR records). There are a few small seasonal pools, wet pans, and swamps scattered throughout the dunes as well as on Stage Island and Cross Farm Hill, but many of these were also artificialy created. Salt marsh fringes the western edge of the island and covers approximately 1,500 acres (600 ha). This is only a small portion of the entire salt marsh system which occurs behind the island. Shaler (1885) states from his survey of the marshes of the Eastern United States that this is the largest salt marsh system north of Long Island Sound, comprising over 20,000 acres (8,000 ha).

Some 2,900 acres (1,180 ha), the southern two-thirds of the island, are now included in the Parker River National Wildlife Refuge. In addition, 120 acres (50 ha) at the southern tip of the island have been set aside as a State Park of the Commonwealth of Massachusetts. Combined, this acreage makes up one of the largest semi-natural barrier beach dune systems north of Cape Cod.

The relatively undisturbed southern portion of the island exhibits the classical physiographic features of a barrier beach dune system. Figure 3 illustrates the typical physiographic features and the major vegetation zones encountered on an east to west transect across the island. The eastern edge of the island, bordering the ocean, is fringed by a strip of beach which changes morphologically depending on the season (Abele, 1977). Parallel to the beach, and adjacent to it, is a foredune ridge which varies from 5 feet (1.6 m) to 35 feet (11.6 m) in height. This ridge receives the greatest impact from storms and is

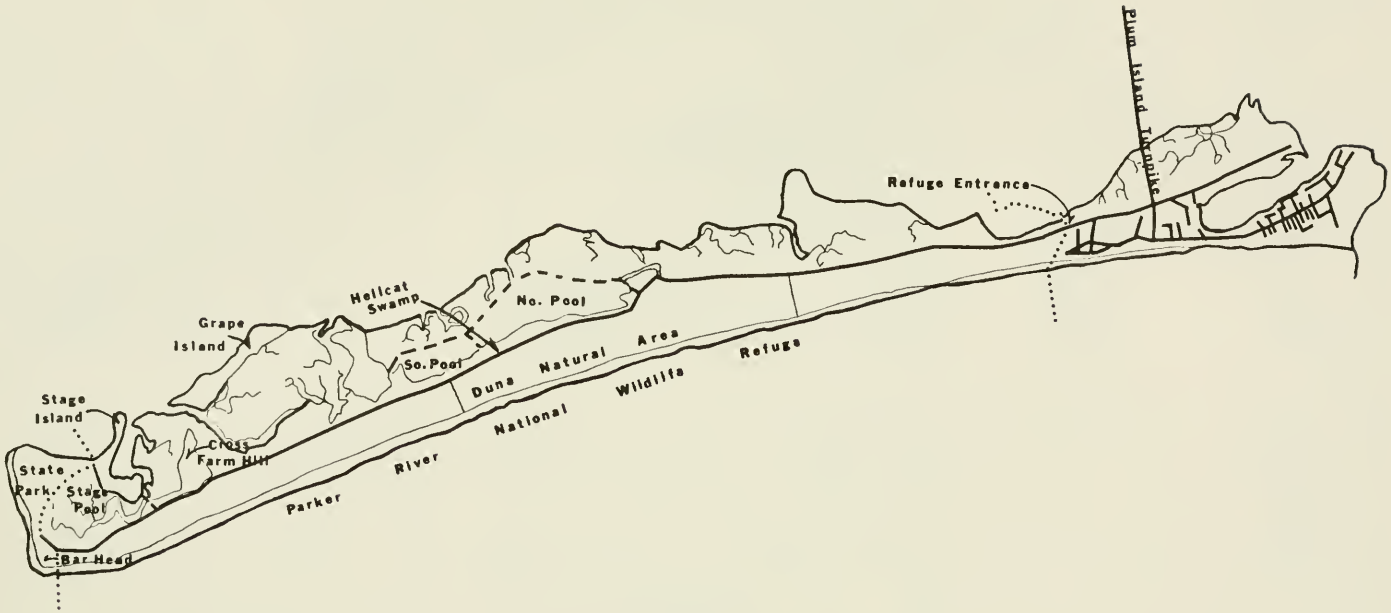

Figure 2. A map of Plum Island, Essex County, Massachusetts.

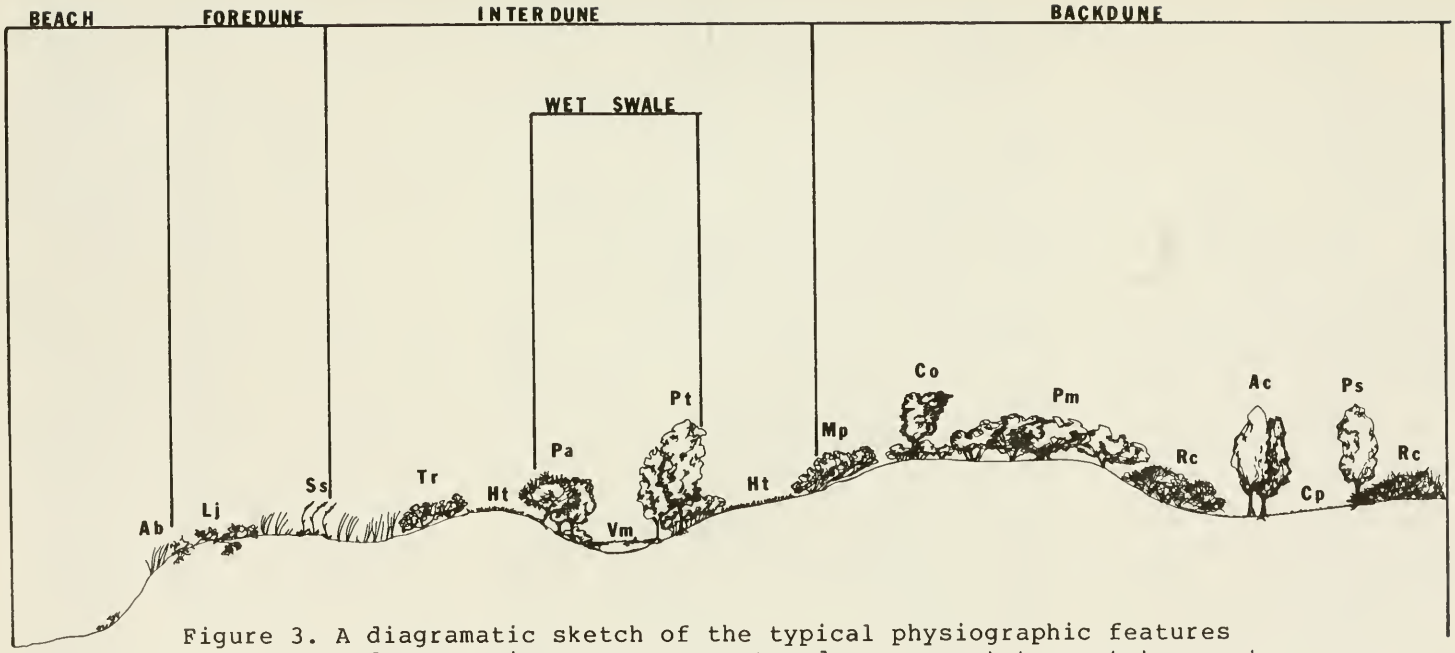

Figure 3. A diagramatic sketch of the typical physiographic features and vegetation zones encountered on an east to west transect across Plum Island.

Key:

Ab	Ammophila breviligulata	Pm	Prunus maritima
Ac	Amelanchier canadensis	Ps	Prunus serotina
Co	Celtis occidentalis	Pt	Populus tremuloides
Cp	Carex pensylvanica	Rc	Rosa carolina
Ht	Hudsonia tomentosa	Ss	Solidago sempervirens
Lj	Lathyrus japonicus	Tr	Toxicodendron radicans
Mp	Myrica pensylvanica	Vm	Vaccinium macrocarpon
Pa	Pyrus arbutifolia		

therefore the most disturbed and least stable area in the dune system. The foredune is naturally adapted to rebuilding itself after a major disturbance. Because of the dynamic nature of the foredune, it is not a continuous ridge but has intermittent gaps caused by blowouts, slip faces, and the development of new dunes (Larsen, 1969). Behind the foredune is the interdune which varies in width from 300 feet (100 m) to 900 feet (300 m), sloping gently upward to the west. In general it has a flat Ammophila grassland appearance, but in many areas there are blowouts and new dunes developing. In addition, there are a number of relatively deep, wet depressions which provide a suitable habitat for the establishment of a variety of trees, shrubs, and herbs.

At the western boundary of the interdune and running parallel to the beach is the backdune ridge. This is the most dramatic feature in the dune system, generally ranging from 25 feet (8.3 m) to 40 feet (13.3 m) tall while reaching heights of over 50 feet (16 m). The highest of these backdunes is High Sandy, which can be seen between parking lots 2 and 3. The backdune ridge is also discontinuous, with gaps up to a half mile (0.8 km.) in some places. The backdune ridge is relatively stable, being covered by a variety of plants, but in a number of places there is an active slip face which is slowly moving in a westerly direction (Larsen, 1969). Due to its height and relative stability the backdune ridge provides excellent protection from sand and salt spray. Thus, behind the ridge small "sunken" forests develop which are populated by a variety of plants. Because of the destructive nature of the salt and sand spray, which frequently occurs over the top of the ridge, none of the trees are ever able to grow above it. In relatively undisturbed areas behind the ridge, such as behind High Sandy, trees up to 50 feet (16 m) have been able to survive. In the Parker River National Wildlife Refuge the road runs behind the stable backdune ridge.

The drumlins at the southern end of Plum Island, including Cross Farm Hill, Stage Island, Bar Head, and Grape Island, are unique to this barrier beach dune system. The drumlins are large mounds composed of clay, sand, gravel, boulders, and other glacial debris formed by the Wisconsin Ice Sheet (Sears, 1905). As will be discussed in a later section, these drumlins provided a point of attachment for the developing island. All the drumlins except Grape Island are directly connected by sand (Fig. 2). The 30 acre (13 ha) island is connected to the sand dune system by salt marsh. The till soils of the drumlins are very fertile and provide the only suitable areas for cultivation on the island.

The island is a dynamic system which is ever changing in appearance. A most dramatic example of this occurred when the Merrimack River changed course. The river originally flowed out to the ocean through what is now The

Basin, at the northern tip of the island (Mulliken, 1951). The most obvious changes to the topography of Plum Island that can be seen today are the eroding Bar Head drumlin at the southern tip of the island and the continuing enlargement of the nearby Sandy Point. The growth of Sandy Point has been well documented by Farrell (1969) and Jones (1977).

CLIMATE

Because of Plum Island's proximity to the coast the adjacent ocean is an important moderating factor in its climate. Climatological data was obtained from the nearby Newburyport Pumping Station and from Rockport, Mass., which is approximately eight miles south southeast of the southern tip of the island (Climate and Man, 1941; Lautzenheiser, 1974, and PRNWR records). The average annual temperature for this region is 50 F (10 C) with a January average of 29.4 F (-1.4 C) and a July average of 67.9 F (19.9 C). Average annual precipitation is 41.19 in (193.14 cm) with the winter season being the wettest due to frequent storms. There is usually very little snow accumulation on the exposed eastern side of the backdune, for it is quickly blown away. However, considerable accumulations occur on the leeward western side of the backdune ridge, particularly in the sunken forests. Winds are primarily westerly or offshore. The storm winds on the other hand are most prevalent from the eastern quadrant, with those most important to beach formation coming from the northeasterly direction (McIntire and Morgan, 1964). Jones (1977) feels that high energy storms are an important mechanism in the development and migration of the Plum Island barrier beach dune system.

GEOLOGIC HISTORY

Plum Island began to form after the retreat of the Wisconsin Ice sheet some 6,300 years ago (McIntire and Morgan, 1964). Upon retreat of the glacier a complex series of sea-land elevation changes took place. About 6,000 years ago the land in this area began to subside while sea level continued its eustatic rise. During this period deposition of coastal sediments was greater than sea level rise and Plum Island began to form (McIntire and Morgan, 1964; Jones

and Cameron, 1976). Rise in sea level caused the salt water to inundate the freshwater marshes along the mainland, allowing salt marsh vegetation to encroach upon the freshwater vegetation. This lead to the development of the extensive salt marsh system present today behind the island. Rapid sea level rise subsided in this area around 3,400 years ago (McIntire and Morgan, 1964). Plum Island continued to enlarge, however, eventually becoming attached to the drumlins at the southern tip of the island (Rhodes, 1971). Current sea level at Plum Island is approximately the same as it was 2,000 years ago (McIntire and Morgan, 1964). The actual process by which the island formed is still a matter of controversy. McIntire and Morgan (1964) concluded that transgressive sea level changes eroded and reworked the glacial sediments, bringing about the formation of Plum Island. Rhodes (1971), through seismic refraction and wash bore sampling, obtained data that gave all major barrier island theories some support. Jones (1977, p. 164) studied the Plum Island-Castle Neck barrier beach system and proposed a new mechanism for barrier island formation. He concluded that "...the high storm energy transportation of sand with spit development is a significant factor for the development and migration of barrier island systems."

From information obtained through peat cores (McCormick, 1969; McIntire and Morgan, 1964), wash bore sampling and seismic refraction, (Rhodes, 1971), an early picture of this area can be developed. Some 6,000 years ago the island was a developing sand spit with the drumlins (Bar Head, Stage Island, Grape Island, and Cross Farm Hill) forming upland islands to the south. A fresh water marsh fringed the mainland along with an encroaching salt marsh. Along the west edge of this developing sand spit there probably existed a small fringe of salt marsh. The area between the spit and the mainland was mostly open water. As time progressed, sea level rose and the sand spit continued to enlarge and migrate westward over the developing marsh. The marshes themselves grew, closing the gap between the mainland and the developing island. As sea level rise slowed, around 3,400 years ago, the developing sand spit became anchored to the drumlins at its southern end, forming the Plum Island of today.

Because of the dynamic nature of the dune system it is impossible to predict exactly what the topography of the island looked like during its early stages of development. It seems reasonable to conclude that the foredune area appeared much the same as it does today while the backdunes were probably less stable and smaller than those now present.

PRESETTLEMENT VEGETATION

In order to obtain an understanding of the early vegetation patterns on the island, palynological literature and historical records were examined. To date there have been no palynological studies done on Plum Island. A reconstruction of the early vegetation (6,000 to 400 years ago) of the island can only be surmised using palynological data collected at nearby New England sites. The historical development of vegetation on Plum Island corresponds with the top level of the pollen profile, specifically zone c. It is generally agreed that the pollen assemblages of this zone closely resemble those of modern day forests (Davis, 1958,1969; Beetham and Niering, 1961; Ogden,1961). From an analysis of pollen profiles from three bogs located in central Massachusetts, Davis (1958) subdivided this zone by the dominant species: oak-hemlock, oak-hickory, and oak-chestnut. In addition to these dominants, pine, black gum, ash, beech, hackberry, basswood, elm, and sugar maple, were also recorded as present (Davis, 1958; Beetham and Niering, 1961). Ogden (1959) found similar vegetation patterns from pollen samples of bogs on Martha's Vineyard, Massachusetts, but noted the absence of chestnut pollen and the apparent decrease of black gum and beech up to modern times. From a comparison of modern and precolonial forests on Martha's Vineyard he concluded the precolonial forests contained the same tree species that are now present on the island but they were more widespread (Ogden,1959).

The environmental factors, e.g. salt and sand spray, have always influenced the distribution of plants on the island. In view of this it seems reasonable to conclude that the appearance of the foredune and interdune plant communities has remained relatively stable since the island was first formed. There are only a limited number of plant species, e.g. beach grass, beach pea, seaside goldenrod, false heather, etc., that have adapted a tolerance to these conditions. As the dunes on the island became older and more stabilized, it seems likely that pitch pine as well as shrubs such as bayberry and beach plum, became established. Finally, with the development of an extensive backdune ridge, the less salt tolerant trees present on the mainland, such as oaks, black gum, poplar, hackberry and maples, were able to form "sunken" forests similar to those now present behind High Sandy and in Hellcat Swamp. The earliest description of the island tends to suggest that it was once more heavily wooded than it is today (Smith, 1837).

After John Cabot's initial discovery of eastern North America in 1497, many explorers and fishermen sailed along the coast of New England (Saville, 1934). An early map of land discovered by the Spanish explorer Esteran Gomez provides evidence that he saw Cape Ann, which is just south

of Plum Island, as early as 1525 (Saville, 1934). It wasn't until 1605, some eighty years later, that De Champlain made the first documented landfall in the area of the present-day town of Rockport, Massachusetts (Saville, 1934). The first recorded description of Plum Island did not appear until 1614. During this year John Smith, while exploring the Atlantic Coast of North America, made the following observation about Plum Island:

> "On the east is an Isle of two or three leagues in length; the one half plain marish grass fit for pasture, with many fair high groves of mulberry trees and gardens; and there is also oaks, pines, and other woods to make this place an excellent habitation, being a good and safe harbor." (Smith, 1837, p.118)

It is obvious from this brief passage that John Smith observed an entirely different view of the island than can be seen today. It appears the island at the time of Smith's visit was relatively stable and covered, at least partially, by a forest of pines and oaks.

Smith's reference to "fair high groves of mulberry trees" is somewhat puzzling. It has been suggested that the mulberry trees Smith mentions were beach plums (Essex Inst. Field Meeting, 1889; Moorehead, 1931). It is my opinion that John Smith mistook the hackberry trees (Celtis occidentalis) which commonly grow on the high back dunes for mulberry trees. The overall profile of the hackberry trees as well as their leaf shape are very similar to and easily confused with those of mulberry. After John Smith's initial description of Plum Island there is very little reference to the appearance of its vegetation in the literature.

LAND USE HISTORY

Early Settlement

Plum Island was first granted to Capt. John Mason by the President and Council of Plymouth in 1621 (Felt, 1834; Waters, 1918). It was originally called Mason's Island. During the 1630's the island became known as Plum Island (Currier, 1896; Waters, 1918). It undoubtedly received this name due to the abundance of beach plums growing there. There is no record of the island being settled before this date, but it is known from the large number of shell middens and artifacts found on the island that it was frequently

used by the Indians, at least on a seasonal basis (Moorehead, 1931). Because of the island's general inaccessibility it was not readily occupied by the early settlers. They primarily used the island as a source of hay, which was cut from the extensive salt marshes bordering the western edge of the island. This was an extremely valuable asset due to the general lack of open pastures elsewhere in the colony (Jewett, 1949). The early settlers also used the island as a winter grazing area for hogs, horses, cattle, and sheep. During these early years the island was under the jurisdiction of the General Court. In 1639 the General Court granted the following towns portions of the island: Ipswich two-fifths, Newbury two-fifths, and Rowley one-fifth (Coffin, 1845; Waters, 1918). Because of the commoners' increasing demand for land, the Town of Ipswich divided its share of the island amongst its residents and it seems that Rowley followed suit (Waters, 1918). It appears that the Town of Newbury maintained ownership of its portion of the island until 1827, when the Town "Proprietors" Committee on undivided lands sold it to Moses Pettingell for $600 (Smith, 1854).

The unrestricted grazing of animals began to take its toll on the island as early as 1667 (Waters, 1918). In 1679 the Selectmen from the Town of Ipswich appealed to the General Court for relief to stop the destruction due to wandering animals owned by residents of Newbury:

> "...the proprietors of Ipswich by reason thereof finding themselves much damnified in that their marshes were trodden to dirt and almost utterly spoiled by a multitude of horses and other cattle put thereon by those of Newbury in the winter to live of what they can get and suffered there to continue till thee middle of May, if no longer which will unavoidably (as experience hath taught us) be the ruin and utter destruction of the whole island, the horses and cattle eating up the grass, that grows upon the sand hills, which gives a stop to the running of the sands in stormy weather, which otherwise would in a very short space cover all the marshes as we have found at Castle Neck. Wherefore we beseech the honored court to prohibit the putting or going of any horses, cattle and so forth, upon the said island and so forth and so forth." (Waters, 1918, p. 11)

The General Court in 1739 finally passed an Act which made it unlawful to let livestock roam free on the island. The general condition of the vegetation on the island must have become a great concern to the land holders, for they pressed the General Court to also make it unlawful to set fire to the vegetation, apparently a common practice, or to cut down

any bushes, shrubs, or trees under the dimension of six inches. From deed records it appears that at this time there was a considerable growth of pines, many of which exceeded six inches in diameter, extending down the center of the island between the marsh and the beach (Waters, 1918). The concern for the well being of the island at this time is conveyed by the General Court:

> "Whereas appears to this Court that there is a great and valuable estate, consisting of salt meadow, lying on the island at the bottom of Ipswich Bay, called Plumb Island, which is exposed and liable to be destroyed by horses, cattle, and other creatures being turned or drove on said island and feeding down the beach-grass, and treading down the sea walls, and ill-minded persons setting fires on said island, whereby the shrubs and grass are destroyed and open a course to the sea and sand, which, if not prevented may overrun and destroy said estate and interest, to the great loss of proprietors and no small (damage) (prejudice) of the publick.." (Waters, 1918, pp. 11-12)

By 1679 the residents of both Ipswich and Newbury were improving the whole island by cutting the salt marsh grass, while some from Ipswich were also planting small parcels (Waters, 1918). Waters (1918), states that the first traces of farming are found on Grape Island, which was easily secured from the roaming animals because it is separated from the main island by tidal creeks. It seems likely that most of the uplands on what is now Cross Farm Hill, Stage Island, and Bar Head were planted with crops. A map made by Daniel Dole sometime during the 1830's, has Bar Head labeled as "Tillage", suggesting that it was under cultivation (Waters, 1918).

As previously mentioned, during the first settlement there was a considerable growth of pine woods fringing the beach and extending down the island in the upland (Waters, 1918). For many years these pines were a source of controversy, at least for the residents of Ipswich. When the town first allotted deeds to the island in 1665, it was unclear whether the eastern boundary of the parcels was the pines or the sea. These pines appear to have been present at least until 1791 (Waters, 1918). It is unclear how long these pine woods survived, but later descriptions of the island suggest that they soon disappeared. Cushing (1826, p. 37), in one of the earliest histories of the area, provides the following description of the island in the early 1800's:

> "It consists of yellow sand, thrown up by the wind into fantastic hillocks, and bearing scarcely any vegetation except thickets of juniper and the plum, from which it derives its name, a very small part of it being capable of cultivation."

Thoreau visited the island in 1839 at the completion of a trip down the Concord and Merrimack Rivers. He provides a similar view of the island at that time:

> "There are but half a dozen houses on it, and it is almost without a tree, or a sod or any green thing with which a countryman is familiar. The thin vegetation stands half buried in sand, as drifting snow. The only shrub, the beach plum, which gives the island its name, grows but a few feet high..." (Thoreau, 1867, p. 261)

This passage, as well as other comments, suggest the island was virtually devoid of trees with only a sparse covering of vegetation, most of which was beach plum. Similarly, Currier provides the following description of the island as it appeared in the late 1890's:

> "... a few straggling bushes, with thin patches of coarse grass scattered here and there and a narrow strip of soft yielding sand washed by the waters of the Atlantic, are the distinctive features and prominent characteristics of Plum Island." (Currier, 1896, p. 212)

It appears that sometime after 1791 the pine forest that once extended down the island disappeared. The exact cause for its destruction is not known for there is no account of it in the literature. It seems reasonable to conclude that the pine forest was either eliminated by natural causes, e.g. a violent storm, or was cut by the inhabitants. It is very possible that the pines were destroyed by the terrible winter storm of 1839, which was the worst storm in the history of the island. According to Smith (1854), the entire eastern end of the island was covered with water:

> "The hotel nearer the bridge was also surrounded with water, while sandhills twenty feet high were washed away, and others formed, the eastern shore being reduced by the action of the waves, many rods." (Smith, 1854, p. 274)

There is really no satisfactory explanation for the

disappearance of the pine forest which once extended down Plum Island. No matter what happened to the trees, one would expect, with the movement of the sands, to see the stumps of this forest occasionally reappear. There is no reference in the literature of this ever occurring on the island, or any mention of it by long-time residents of the area.

It is interesting to note that Townsend (1913, p. 84), while describing the Castle Neck sand dunes, which are across the bay from the southern tip of Plum Island, states:

> "Mr. C. J. Maynard tells me that forty years ago not only were there no pines, but no large clumps of bushes to be found in the dunes."

Thus around 1873 the Castle Neck dunes appeared very similar to those on Plum Island at that time. It seems likely that the forests which once covered both dune systems succumbed to the same fate.

Modern Development

For 190 years after John Smith first described Plum Island the only access to it was by boat. In many ways this was beneficial, for it successfully prevented any large scale habitation of the island. It wasn't until 1806 that the Plum Island Turnpike and Bridge Corporation completed the first turnpike to the island by building a bridge across the Plum Island River (Currier, 1896). The bridge was seriously damaged in 1818 and a number of times thereafter (Smith, 1854). It was completely washed away in 1832, remaining in disrepair for the succeeding five years. It was destroyed again in 1851 and rebuilt a short time afterward (Smith, 1854). The year following the completion of the turnpike a hotel was built on the island near what is today the junction of Northern Boulevard and Plum Island Turnpike (Smith, 1854). This area became known as Plum Island Center.

In 1886, a horsecar line was built from Plum Island Center to the steamboat landing, at the northern tip of the island, to provide passenger service between the hotel and the steamboat landing.[2] In 1887 track was completed from Newburyport across the Plum Island Bridge to Plum Island Center. During the summer of that year regularly scheduled horsecar service ran between Market Square, Newburyport, and

[2] All of the following information concerning train service to Plum Island is from Massachusetts Northeastern Street Railway vol. 1 by O. R. Cummings (1964).

Plum Island Center. Horsecar service on this line continued on a seasonal basis until 1895 when it was replaced by electric trolley. The Citizen's Electric Street Railway and the Newburyport Division of the Massachusetts Northeastern took over the rail service and continued regular trolley service from Market Square to Plum Island Point during the summer months. Seasonal rail service to the island was discontinued during the summer of 1922, and was apparently replaced by the competing bus line.

The northern third of the island, which had belonged to the Pettingell family since 1827, was sold to the Draper syndicate of Boston in 1920 (Cummings,1964). The syndicate formed the Plum Island Beach Company and began construction of what is now Northern Boulevard during the same year, with the intention of making the area suitable for the development of summer cottages (Cummings, 1964). Plum Island Beach originally included the entire area north of Plum Island Turnpike. Lots were sold for as low as $350, and if they were purchased on the installment plan one was given free life insurance (PRNWR records).

The indiscriminate development of the northern end of the island that followed proved to be unfortunate in regard to its effect on the dune system. Unable to withstand the subsequent increased impact, much of the natural vegetation was eliminated and in many places the dunes themselves were destroyed. As can be seen today this has upset the natural balance and may ultimately threaten the stability of the entire dune system. Travel over the sand to the southern end of the island was difficult, whether by foot or by wagon. Thus the principle means of access to the southern end of the island was by boat, particularly the Carlotta, which docked at both Stage Island and Grape Island (Griscom, 1955; Waters, 1918). A combination of factors spared this end of the island from the fate of the northern end, for it never developed into a summer cottage resort. During the 1800's and early 1900's the southern end of the island contained farms on Cross Farm Hill and Stage Island, one hotel, a few hunting and fishing camps, a Coast Guard Life Saving Station, and some cottages (Griscom, 1936, 1955). The greatest concentration of cottages occurred around the base of Bar Head and on Sandy Point (Griscom, 1955; Kilborn, personal communication). According to Mr. Kilborn, a long time resident of Grape Island, there were a number of houses on Grape Island and at least two hotels, one at either end of the island.

After the initial colonial impacts, the southern two-thirds of the island remained relatively undisturbed during the past century. Its inaccessibility helped to limit development, but this portion of the island wasn't without human disturbance. As related by Waters (1918), one of the largest impacts during this period arose from a grand scheme conceived by the Frenchman Gilshenon to establish a salt works on the island. In 1829 Gilshenon and his crew

began digging vats in the peaty sod in what is now Stage Island Pool. A large ditch was dug around the vats and a dike was constructed across Bar Head Creek to Stage Island. Water was pumped by six windmills into the vats where it was evaporated by the heat of the summer sun. As the water evaporated the salt crystals would accumulate on the sides of the vats. This operation had a considerable impact on the area, for besides the windmills, dikes, and vats, gravel was hauled from Bar Head to build a seawall to protect the vats from unusually high tides. This venture was extremely short-lived, for operations ceased during the summer of 1830.

Another more profitable enterprise which had somewhat less impact on the island was the digging of sand from Sandy Point for use in making cement (Waters, 1918; Kilborn, personal communication). Boats would be grounded at low tide, the crew would then quickly fill their ship with sand using wheel-barrows and be completely loaded before the next high tide (Waters, 1918). According to Kilborn (personal communication), four generations of Doles sold sand from Sandy Point receiving at one point $33 for 350 tons.

In addition there were other smaller impacts on the vegetation, including the occasional burning of the salt marsh grass and the beach grass on the dunes. Also, the cranberries which grow in the wet hollows between the dunes were harvested and sold commercially, and the beach plums which abound on the island were picked by residents from all the surrounding towns (Kilborn, personal communication).

Through the joint efforts of the Federation of Bird Clubs of New England and the Massachusetts Audubon Society, approximately 1,200 acres (480 ha) at the southern end of the island were purchased between 1930 and 1936 to form the Annie Brown Wildlife Sanctuary (Griscom, 1955). The sanctuary was established to protect the many birds that frequented the island, for this was a very popular hunting area. But according to Griscom (1955), even after the establishment of the sanctuary it was difficult to completely eliminate hunting in the area. The creation of the Annie Brown Wildlife Sanctuary proved to be an important step in the preservation of the southern portion of the island.

In 1942 the United States Government acquired the land included in the Annie Brown Wildlife Sanctuary to form the Parker River National Wildlife Refuge (Muck, 1945). With the acquisition of an additional 3,050 acres (1,220 ha) on both the island and the mainland, the refuge has grown to include some 4,650 acres (1,860 ha). Approximately 2,900 acres of the southern portion of the island are included within the Parker River National Wildlife Refuge. A few years later some 120 acres (50 ha) at the extreme southern tip of the island became a State Park of the Commonwealth of Massachusetts, effectuating the preservation of the entire

southern two-thirds of the island. This portion of the island now makes up the most extensive permanently protected dune system north of Cape Cod. Because of the island's strategic location on the Atlantic flyway, the protected southern portion serves as an important sanctuary for migratory waterfowl as well as for resident nesting birds (Griscom, 1955; Carson, 1947a, b). In addition, it also provides many recreational opportunities including swimming, sunbathing, birdwatching, and other nature activities.

The greatest impacts on this portion of the island since its inclusion in the Parker River National Wildlife Refuge have been the extension of the road to the southern tip of the island, opening up this once secluded area to the general public, and the construction of the dike forming North and South Pools. The construction of the dike eliminated a number of acres of salt marsh to create fresh water habitat in an effort to provide additional waterfowl nesting areas. Freshwater aquatic plants, not commonly found elsewhere on the island, have become established in the impoundments. Unfortunately a pest plant, Lythrum salicaria, has become the dominant vegetation type in some areas of the impoundments, effectively eliminating more desirable species. Efforts by the Refuge staff to eliminate this plant have not been successful.

During 1954 a control burn in the North impoundment jumped the road and burned a considerable number of acres of dune before it was brought under control (Stubbs, personal communication, PRNWR records). To prevent erosion, the area was quickly planted with black pines (Pinus nigra). The area is now covered by a pine forest which provides an excellent habitat for many migratory birds.

As houses within the refuge boundaries become abandoned they are taken down by the refuge staff, giving the area an even more natural appearance. In the 1950's a fence was erected south of parking lot 1, which prevented people from using the southern end of the island (Gavutis, personal communication). It was taken down sometime in the early 1960's, but while it was up it successfully limited impact on that end of the island (Gavutis, personal communication). In the late 1960's, in a very important management decision, all vehicles were eliminated from driving on the dunes (Stubbs, personal communication). Vehicles have a very detrimental effect on the vegetation and had a considerable impact on the dunes.

Today the major impact on this dune system is human trampling. Over 400,000 people visited the Refuge during 1977 alone (PRNWR records). Although human trampling does not have an immediate gross impact on an area, it does effect the development and maintenance of the dune system. The dune system, though well adapted to absorbing the impact of coastal storms, is fragile and can be severely, and sometimes permanently, damaged by human trampling.

Destruction of the fragile network of vegetation covering the dunes disrupts the stabilizing process, and shifting sands may then engulf and bury established plant communities. Continuous pressure from human activity prevents reestablishment of the vegetation, and the stability of the whole dune system may be seriously threatened. The results of a study of the effects of human trampling on the coastal dune vegetation in the refuge are presented in another report (see McDonnell (1979)). With the current management techniques used by both the Refuge and Plum Island State Park staffs the effects of early land misuse have begun to disappear. Visitors to Plum Island should be aware of the fragile nature of the vegetation and make an effort to keep trampling to a minimum.

PREVIOUS BOTANICAL WORK

Although Plum Island was located within easy traveling distance from the residences of such notable botanists as Jacob Bigelow, Manasseh Cutler, William Oakes, Charles Pickering, John Robinson and John Sears, as well as many other less well known collectors, it was virtually ignored botanically. The first documentation of the flora of the island comes from Bigelow (1824) in the expanded second edition of his Florula Bostoniensis. He mentions the occurrence of Arenaria peploides (beach arenaria), Hudsonia tomentosa (downy hudsonia), and Prunus littoralis (= P. maritima Marsh., beach plum) on the island.[3] It appears that Bigelow observed these species sometime between 1814 and 1824 (Bailey, 1883). The earliest extant herbarium specimens from the island were collected by Oakes. Although the specimens I have seen were not dated, they were no doubt collected sometime between 1817 and 1842. It appears from the type of collections made by early botanists, e.g. Puccinellia fasciculata by Oakes, Aristida tuberculosa by William Boott, Smilacina stellata by Arthur Cole, and Arabis drummondi by Emile Williams, that they were collecting only the rare and unique plants which occurred on the island. Before 1900 only 26 taxa were collected from the island; of these 21 were monocots and 5 dicots.

Cyrus Tracy's (1858) Studies of the Essex Flora was the first botanical work specifically dealing with plants growing in Essex County. It includes only the area around the town of Lynn and has no specific mention of Plum Island. Some twenty-three years later Robinson (1880) published the

[3] Author citations appear in the "Flora".

first Flora of Essex County. It was the most complete catalog of plants growing in the area yet to be published, as well as one of the first local floras of New England. It proved particularly important in documenting the occurrence of the plants in specific localities throughout the county. Although by no means complete, specific reference was made to the plants growing on Plum Island. Also during this period, Edward Moulton (1891) published thirty-two articles in the Daily Standard, a Newburyport newspaper, on the flora of the vicinity, which included some plants growing on Plum Island.

Between 1900 and 1950 the most active botanists on the island were Arthur Stanley Pease, Harold St. John, and Donald White. From extant specimens, the species list for the island at that time included approximately 108 taxa. In 1942 a list of the more common plant species occurring in the proposed Parker River National Wildlife Refuge, which included the southern portion of the island, was developed (Gashwiler, 1942). Another partial list of plants growing on the Refuge portion of the island was developed by Waldo Kennedy (1950) but, like the previous list, it is difficult to verify the existence of the species since no voucher specimens could be found.

It was not until 1956 that any concerted effort was made to document the flora of the island. It appears that Stuart K. Harris, while working on a modern flora of Essex County, noticed the absence of specimens from Plum Island in herbaria. In 1956 alone, he collected over 190 different taxa on the island. In 1957 he again collected heavily on the island, this time accompanied by Frank McGregor and Charles Schweinfurth. When his Flora of Essex County was finally published posthumously in 1975, it referenced 320 taxa as occurring on Plum Island.

During the 1960's and early 1970's a number of lists of the plants growing in the Refuge portion of the island were compiled by refuge personnel, student assistants, and botanists (PRNWR records). One of the more complete lists was compiled by Diana Seacord (1967) for a Senior Honors Thesis. She combined lists compiled by Harris (PRNWR records) and Kennedy (1950) along with her own collections. This list contains many dubious records which seem very unlikely to occur on the island, but their occurrence cannot be verified for her voucher specimens have not been located.

PLANT ASSOCIATIONS

Plum Island can be divided into five major physiographic zones (described in Chapter 2). Running from east to west across the island, they include the 1) beach, 2) foredune, 3) interdune, 4) backdune, and 5) salt marsh. In this section the dominant plant associations in each zone are described. The vegetation in the backdune is very diverse and has been further divided into four vegetation types: scrub forest, shrub thickets, pine forest, and meadow. The plants which occur in the freshwater habitats created by the construction of North and South Pools and the damming of Stage Island Pool are discussed in a separate section. Roadsides and waste places provide a distinct habitat for a number of plant species. The plants commonly found in these areas will be described in the last section.

Beach

The beach is normally a very dynamic area, not typically thought of as a habitat for vascular plants. On the upper edge of the beach, above the mean high tide, a few plants have become established. Four species in particular tend to grow in this zone: Cakile edentula (sea-rocket), Salsola kali (saltwort), Raphanus raphanistrum (wild radish), and Ammophila breviligulata (beach grass). Occasionally, after a winter storm, portions of the salt marsh are washed up on the beach and such species as Spartina patens (saltmeadow hay) and Distichlis spicata (spike-grass) have continued to grow, at least for a short time.

Foredune

The extreme environmental conditions, such as intense salt spray and wind, sand accumulation, low moisture content and acute temperature fluctuations, serve to limit species diversity on the foredune. The dominant species in this community is Ammophila breviligulata (beach grass), in some areas making up 100 percent of the vegetation cover. Other less predominant species which also occur in this zone include Lathyrus japonicus (beach pea), Artemisia stellariana (dusty miller), Solidago sempervirens (seaside goldenrod), Salsola kali (saltwort), and Euphorbia polygonifolia (seaside spurge). In general these species are not as abundant as A. breviligulata, but in some areas L. japonicus and Artemisia stellariana become the dominant vegetation cover.

Interdune

The interdune is somewhat more protected and stable than the foredune. Environmental conditions become less severe farther away from the beach, thus the interdune is composed of a number of plant communities. In general this area has a sparse grassland appearance, with the dominant species again being Ammophila breviligulata (beach grass). In open areas behind the foredune, intermixed with A. breviligulata, are Artemisia stellariana (dusty miller), Solidago sempervirens (seaside goldenrod), Euphorbia polygonifolia (seaside spurge), and occasionally Lathyrus japonicus (beach pea). Small islands of Toxicodendron radicans (poison ivy) can also be found quite near the foredune ridge.

Away from the beach, at the western boundary of the interdune, Hudsonia tomentosa (false heather) is the dominant vegetation type in areas with limited sand movement. H. tomentosa tends to form large dense mats which produce a spectacular yellow carpet in the spring when it is in flower. Particularly large H. tomentosa mats have formed in the Dune Natural Area and between parking lots 5 and 6. Other less abundant species in this community include Polygonella articulata (jointweed), Cyperus spp. (sedge), Lechea maritima (pinweed), Solidago sempervirens (seaside goldenrod), Andropogon scoparius (blue-stem), and Aster linariifolius (aster).

The interdune is also sculptured with many depressions, which provide suitable protection and enough moisture for trees and shrubs to become established. The upper story of vegetation in these wet swales includes Populus tremuloides (trembling aspen), Acer rubrum (red maple), Amelanchier canadensis (shadbush), Alnus spp. (alder), and Prunus spp. (wild cherry). The understory is usually a dense shrub thicket composed of such species as Toxicodendron radicans (poison ivy), Myrica pensylvanica (bayberry), Salix spp. (willow), Pyrus arbutifolia (red chokeberry), Parthenocissus quinquefolia (Virginia creeper), Vaccinium corymbosum (highbush blueberry), Lyonia ligustrina (maleberry), Viburnum recognitum (arrow-wood), Spiraea tomentosa (steeple-bush), and Ilex verticillata (winterberry).

In addition to these shrub thickets, a number of cranberry swales can be found in hollows between the dunes. The dominant species is Vaccinium macrocarpon (cranberry), which forms dense mats. Other species such as Hypericum boreale (St. John's-wort), Drosera intermedia (sundew), Xyris torta (yellow-eyed grass), Scirpus cyperinus (wool-grass), and Juncus balticus (rush) are also found in these swales.

Backdune

The backdune is floristically the most diverse area on the island. The eastern boundary of this zone is formed by the backdune ridge. The slopes of this ridge are covered primarily by shrubs, the most common being Rosa carolina (rose), Myrica pensylvanica (bayberry), Prunus maritima (beach plum), Prunus serotina (black cherry), and Toxicodendron radicans (poison ivy). Behind the protection of the backdune ridge many plant species are able to become established. Although many vegetation associations are present, four major vegetation types have been recognized: scrub forest, shrub thicket, pine forest, and meadow.

The most prevalent vegetation type found behind the backdune ridge is a mixture of scrub forest and shrub thicket. Along most of the island the trees are small and relatively young, the dominant species being Prunus serotina (black cherry), Amelanchier canadensis (shadbush), and Acer rubrum (red maple). Other less dominant species include Quercus velutina (black oak), Celtis occidentalis (hackberry), Sassafras albidum (sassafras), and Nyssa sylvatica (black gum). Although the understory vegetation varies from area to area the most common species include Aralia nudicaulis (wild sarsaparilla), Toxicodendron radicans (poison ivy), Arenaria lateriflora (grave sandwort), Teucrium canadense (wood-sage), and Smilax rotundifolia (common greenbrier). The largest and oldest forests on the island occur behind High Sandy in what is called the Kettle Hole, although it is not a true kettle hole in the geological sense. Due to the unique plant communities which have developed in these areas, efforts should be made to ensure their preservation.

In open and recently disturbed areas shrub thickets have become established. On uplands such as Bar Head, Grape Island, and along the borders of Stage Island, Lonicera morrowi (honeysuckle) forms dense thickets. Behind the backdune ridge the major species forming shrub thickets include Rosa spp. (rose), Myrica pensylvanica (bayberry), Rubus spp. (blackberry), Ribes hirtellum (gooseberry), Prunus maritima (beach plum), Amelanchier stolonifera (shadbush), Celastrus scandens (bittersweet), Smilax rotundifolia (common greenbrier), and Vitis spp. (wild grape).

An extensive pine forest exists behind the backdune ridge midway down the island. It is predominantly composed of the introduced Pinus nigra (Austrian pine) with an occasional P. strobus (white pine) persisting in protected areas. These were planted by Refuge personnel to help stabilize the dunes. Smaller stands of P. nigra which occur in the backdune were also planted. Only a few small stands of the naturally occurring P. rigida (pitch pine) are still

present on the island. The largest of these is found by parking lot 5 along the Pines Nature Trail. The understory of these pine stands is sparse. The dominant species is Carex pensylvanica (sedge), which forms dense mats giving the area a parklike appearance. Other species such as Vaccinium spp. (blueberry), Arctostaphylos uva-ursi (bearberry), Maianthemum canadense (Canada mayflower), and Trientalis borealis (star flower) also commonly occur under the pines.

The meadows on the island are maintained by the Refuge as goose pastures. The largest of these are on Cross Farm Hill and Stage Island, with smaller meadows occurring along the eastern edge of North and South Pools and adjacent to Subheadquarters. They are predominantly covered by such grass species as Agropyron repens (witch grass), Lolium perenne (common darnel), Phleum pratense (timothy), Poa spp. (bluegrass), Agrostis spp., Festuca spp. (fescue) and occasionally a few patches of Secale cereale (rye). In addition to the grasses, such species as Ranunculus repens (creeping buttercup), Rumex acetosella (sheep sorrel), Trifolium spp. (clover), Daucus carota (wild carrot), Vicia spp. (vetch), and Convolvulus sepium (hedge bindweed) can also be found growing in the meadows.

Freshwater Habitats

The construction of North and South Pools and the damming up of Stage Island Pool greatly increased the acreage of freshwater habitats on the island. In addition to providing excellent waterfowl feeding and nesting areas, they provide habitats for freshwater aquatic plants not commonly found elsewhere on the island. Unfortunately they provide ideal conditions for the establishment of Lythrum salicaria (purple loosestrife), a pest plant that covers much of North and South Pools. Other plants forming large colonies in the impoundments include Typha spp. (cat-tail), and Phragmites australis (reed grass). The dominant floating aquatics in the impoundments are Potamogeton perfoliatus (pondweed), P. pectinatus (sago pondweed), and Lemna minor (duckweed). Along the muddy shores extensive mats of Eleocharis parvula (spike rush) have formed. Other less dominant species that occur along the shores include Sagittaria latifolia (arrowhead), Lythrum hyssopifolia (hyssop-leaved loosestrife), Bidens spp. (beggar-ticks), Thelypteris palustris (marsh fern), Onoclea sensibilis (sensitive fern), Ludwigia palustris (water purslane), Lycopus spp. (water-horehound), and Iris versicolor (blue flag).

Salt Marsh

The dominant species growing in the extensive salt marshes behind Plum Island are the marsh grasses Spartina alterniflora (saltwater cordgrass) and S. patens (saltmeadow grass), while the less dominant S. pectinata (freshwater cordgrass) and S. caespitosa occur along the upper borders. Before the turn of the century these marshes were an important source of salt marsh hay (Jewett, 1949). In addition to the salt marsh grasses the more common plants growing on the marsh include Limonium carolinianum (sea lavender), Gerardia maritima (gerardia), Salicornia europaea (samphire), Spergularia marina (sand-spurrey), Aster subulatus (salt marsh aster), Bassia hirsuta, Sueada spp. (sea-blite), Glaux maritima (sea milkwort), Plantago oliganthos (seaside plantain), Iva frutescens (marsh-elder), Potentilla egedei, Triglochin maritima (arrow-grass), and Puccinellia maritima (goosegrass).

Roadsides and Disturbed Areas

The disturbance due to the development of the north end of the island and the completion of the road through the Refuge has provided additional habitats for plants not commonly found on barrier beach dune systems. Those commonly found in these disturbed areas include Saponaria officinalis (soapwort), Lepidium virginicum (poor-man's pepper), Spergularia rubra (sand-spurry), Euphorbia esula (leafy spurge), Verbascum thapsus (common mullein), Artemisia vulgaris (common mugwort), Solidago spp. (goldenrod), Asclepias syriaca (common milkweed), Mullugo verticillata (carpetweed), Bromus tectorum (wild oats), Oenothera biennis (evening primrose), Achillea lanulosa (yarrow), Ambrosia artemisiifolia (ragweed), and Chrysanthemum leucanthemum (white daisy).

TAXONOMY, ARRANGEMENT, and VOUCHER SPECIMENS

The following taxa of vascular plants were collected on Plum Island during the spring of 1977 through the spring of 1979. The taxonomy and arrangement of families follows that of Fernald (1950) unless otherwise stated. To fascilitate use of the flora, genera and species are arranged alphabetically within each family. The taxonomy of the ferns follows Tryon (1978). Cultivated plants that are persisting have been included in the flora.

In an attempt to make the flora as complete as possible those species cited by Harris (1975) as occurring on the island, although not found by the author, are included. The herbaria of Boston University (BU), the University of Massachusetts (MASS), the New England Botanical Club (NEBC), the University of New Hampshire (NHA), and the Peabody Museum of Salem (PM) were searched for Plum Island specimens. These specimens are cited in the list by author's name, collection number, and herbarium in which they are deposited. The specimens collected by the author are cited as MJM, followed by the collection number. Voucher specimens have been deposited in the Hodgdon Herbarium, University of New Hampshire (NHA).

The importance of each taxa has been designated using the following quantitative estimates based on coverage in the vegetation type were it occurs: rare less than 1 percent; occasional 1 to 5 percent; frequent 5 to 50 percent; common 50 to 75 percent; abundant 75 to 100 percent. Even though these are only estimates it is felt they will provide a basis for detecting floristic changes.

ABBREVIATIONS

BU - Stuart K. Harris Herbarium of Boston University, Boston, MA.

GH - Gray Herbarium of Harvard University, Cambridge, MA.

HNH - Jesup Herbarium of Dartmouth College, Hanover, NH.

MASS - Herbarium of the Univ. of Massachusetts, Amherst, MA.

MJM - Mark J. McDonnell

NEBC - Herbarium of the New England Botanical Club, Boston, MA.

NHA - Hodgdon Herbarium of the University of New Hampshire, Durham, NH.

PM - Herbarium of the Peabody Museum of Salem, Salem, MA.

PRNWR - Parker River National Wildlife Refuge

FLORA OF PLUM ISLAND

EQUISETACEAE (Horsetail Family)

EQUISETUM L.

E. arvense L. Horsetail

Occasional; along side of road at southern end of Refuge, on Bar Head and Grape Island. MJM 373, 531, 1119.

LYCOPODIACEAE (Clubmoss Family)

LYCOPODIUM L.

L. inundatum L. Bog Clubmoss

Rare; Cranberry swale in dunes adjacent to Camp Sea Haven. MJM 429, 859, 904.

OSMUNDACEAE (Flowering Fern Family)

OSMUNDA L.

O. cinnamomea L. Cinnamon Fern

Occasional; wet ditch along road at southern end of Refuge and in Hellcat Swamp. MJM 323, 636, 1028.

O. claytoniana L. Interrupted Fern

Rare; wet swale in dunes south of parking lot 5 and north of beach access road. MJM 1086.

O. regalis L. Royal Fern

var. spectabilis (Willd.) Gray

Occasional; wet areas along road at extreme southern end of Refuge and in wet swales between the dunes. MJM 322, 387, 592.

POLYPODIACEAE (Fern Family)

ATHYRIUM Roth

A. filix-femina (L.) Roth — Lady Fern

var. michauxii (Spreng.) Farw.

Rare; along edge of Stage Island Pool. MJM 542.

ONOCLEA L.

O. sensibilis L. — Sensitive Fern

Common; wet areas throughout island. MJM 321.

PTERIDIUM Gleditsch

P. aquilinum (L.) Kuhn — Bracken Fern

var. latiusculum (Desv.) Underw.

Rare; backdune Prunus understory near parking lot 5. MJM 443.

THELYPTERIS Schmidel.

T. palustris Schott — Marsh Fern

Common; freshwater marshes and wet areas. MJM 550, 593, 1120.

T. phegopteris (L.) Slosson — Long Beech Fern

Occasional; along eastern edge of Grape Island on rich bank. MJM 1136.

PINACEAE (Pine Family)

JUNIPERUS L.

J. virginiana L. — Red Cedar

Occasional; throughout backdune. MJM 345, 1070.

PINUS L.

P. nigra Arnold — Austrian Pine

Cultivated; introduced to stabilize dunes, forming large plantations behind the backdune ridge. MJM 356.

P. rigida L. — Pitch Pine

Common; throughout backdune, a particularly healthy stand occurs near parking lot 5. MJM 342.

P. strobus L. — White Pine

Cultivated; a few plants persistent in the P. nigra plantations. MJM 1031.

TYPHACEAE (Cat-tail Family)

TYPHA L.

T. angustifolia L. — Narrow-leaved Cat-tail

Occasional; marshes throughout southern end of island, well represented around Stage Island Pool. MJM 464, 518, 1245.

T. X glauca Godr.

Occasional; North and South Pools. A hybrid between T. angustifolia and T. latifolia. MJM 1039.

T. latifolia L. — Common cat-tail

Common; marshes throughout island. MJM 712, 1084.

SPARGANIACEAE (Bur-Reed Family)

SPARGANIUM L.

S. sp. Bur-reed

Rare; a few sterile plants growing in shallow water in South Pool. It is impossible to determine species without fruiting material. Harris (1975) reports eight species of the genus as occurring in Essex County. MJM 1248.

ZOSTERACEAE (Pondweed Family)

POTAMOGETON L.

P. oakesianus Robbins Pondweed

Rare; small pool in dunes east of parking lot 6. MJM 739.

P. pectinatus L. Sago pondweed

Occasional; locally abundant in South Pool. MJM 644, 1254.

P. perfoliatus L. Pondweed

var. bupleuroides (Fern.) Farwell

Common; North pool and locally abundant in small pond on Stage Island. MJM 868, 1174, 1328.

P. pusillus L. Pondweed

var. tenuissimus Mert. and Koch

Occasional; locally abundant in deep pool in dunes between parking lots 1 and 2 and in North Pool. MJM 488, 863.

RUPPIA L.

R. maritima L. Widgeon Grass

Frequent; in shallow pools in salt marsh. MJM 1087, 1229.

JUNCAGINACEAE (Arrow-Grass Family)

TRIGLOCHIN L.

T. maritima L. Arrow-grass

Abundant; upper edges of salt marsh. MJM 285.

ALISMATACEAE (Water-Plantain Family)

SAGITTARIA L.

S. latifolia Willd. Arrowhead

forma gracilis (Pursh) Robins.

Occasional; on edge of small pool on Stage Island. MJM 1178.

forma hasata (Pursh) Robins.

Occasional; on muddy shore of North Pool. MJM 607.

GRAMINEAE (Grass Family)

AGROPYRON Gaertn.

A. pungens (Pers.) R. and S.

Rare; sandy coast. Harris, 1975.

A. repens (L.) Beauv. Witch Grass

forma aristatum (Schum.) Holmb.

Occasional: Harris 12902 [NEBC].

var. subulatum (Schreb.) Fern.

Rare; Harris, 1975.

var. subulatum
forma vaillantianum (Wulf. and Schreb.) Fern.

Occasional; roadsides and waste places. MJM 400, 473, 585.

AGROSTIS L.

A. alba L. Red Top

Common; fields and on banks of dike surrounding North and South Pools. MJM 508, 535.

var. palustris (Huds.) Pers. Creeping Red Top

Locally abundant; along edge of Stage Island Pool. MJM 660.

A. perennans (Walt.) Tuckerm. Upland Bent

Occasional; under pines. MJM 579.

A. scabra Willd. Hairgrass

Occasional; on dike surrounding North and South Pools. MJM 630.

A. tenuis Sibth. Rhode Island Bent

Occasional; under thickets in backdune. MJM 390, 599.

AMMOPHILA Host.

A. breviligulata Fern. Beach Grass

Abundant; throughout island in open sand. MJM 583.

ANDROPOGON L.

A. scoparius Michx. Blue-Stem

var. septentrionalis Fern. and Grisc.

Abundant; throughout backdune. MJM 859, 857.

ARISTIDA L.

A. longespica Poir.

var. geniculata (Raf.) Fern.

Rare; single collection 1896. Eaton s.n., 3 Sept. 1896

[NEBC].

A. tuberculosa Nutt. Seabeach Needle Grass

Common; open sands throughout island and in disturbed areas at northern end. On Massachusetts rare and endangered species list. See Coddington and Field, 1978. MJM 860.

BROMUS L.

B. inermis Leyss. Awnless Brome Grass

forma aristatus (Schur) Fern.

Occasional; along road leading to Stage Island. MJM 1165.

B. mollis L. Soft Chess

Occasional; waste places. Harris 12097 [NEBC].

B. secalinus L. Chess

Occasional; along roadsides at southern end of island. MJM 1222.

B. tectorum L. Wild Oats

Common; open sands and disturbed areas. MJM 1038

CALAMAGROSTIS Adans.

C. canadensis (Michx.) Nutt. Blue-joint

Frequent; along roadsides. MJM 395, 1160.

DACTYLIS L.

D. glomerata L.

Occasional; open sands. Ahles 77617 [MASS].

DANTHONIA DC.

D. spicata (L.) Beauv. Poverty-Grass

Occasional; in clearings in backdune with Carex pensylvanica. MJM 598.

DESCHAMPSIA Beauv.

D. flexuosa (L.) Trin. Common Hairgrass

Occasional; thickets in backdune. MJM 428.

DIGITARIA Heist.

D. ischaemum (Schreb.) Muhl. Small Crab-Grass

Occasional; disturbed areas and waste places. MJM 898.

D. sanguinalis (L) Scop. Crab-Grass

Occasional; disturbed areas and waste places. Harris 12533 [NEBC].

DISTICHLIS Raf.

D. spicata (L.) Greene Spike-Grass

Abundant; upper edge of salt marsh. MJM 1188, 1309.

ECHINOCHLOA Beauv.

E. crusgalli (L.) Beauv. Barnyard-Grass

Common; goose field adjacent to North Pool. MJM 1321, 1324.

E. muricata (Beauv.) Fern.

(= E. pungens (Poir.) Rydb. in Fernald, 1950.)

Occasional; disturbed areas. Harris 12454 [NEBC]. (Taxonomy follows Voss, 1966.)

ELYMUS L.

E. villosus Muhl.

Rare; last collected in 1897. Eaton 533 [NEBC].

forma arkansanus (Scribn. and Ball) Fern.

Rare; grape swamp. Single collection 1896. Eaton s. n., 29 Aug. 1896 [NEBC].

E. virginicus L. Wild Rye

Common; along upper edge of salt marsh. MJM 725, 1355.

FESTUCA L.

F. capillata Lam.

Occasional; sand dunes. Ahles 77548 [MASS].

F. elatior Meadow-Fescue

Occasional; meadows and roadsides. Harris 12045 [NEBC].

F. obtusa Biehler

Occasional; understory of scrub forest. MJM 383.

F. rubra L.

var. rubra

Occasional; field adjacent to Subheadquarters. MJM 495a.

var. juncea (Hack.) Richter

Occasional; beneath thickets in backdune. MJM 412a.

GLYCERIA R. Br.

G. grandis S. Wats. Reed-Meadow Grass

Common; edge of North Pool. MJM 1041.

G. laxa Scribn. Manna Grass

Occasional; along boardwalk in Hellcat Swamp. MJM 664.

HIEROCHLOE R. Br.

H. odorata (L.) Beauv. Sweet Grass

Common; upper borders of salt marsh. MJM 1005, 1061.

HORDEUM L.

H. jubatum L. Squirrel-Tail

Occasional; fields. MJM 1255.

LOLIUM L.

L. multiflorum Lam. Italian Rye-Grass

Occasional; goose field adjacent to North Pool. MJM 823.

L. perenne L. Common Darnel

Occasional; southern end of island. Harris 12099 [NEBC].

PANICUM L.

P. columbianum Scribn.

var. oricola (Hitchc. and Chase) Fern.

Rare; single collection 1913. St. John and White 554 [NEBC].

P. depauperatum Muhl.

Occasional; open sand. Ahles 77582 [MASS].

P. lanuginosum Ell.

var. fasciculatum (Torr.) Fern.

Common; open sand in backdune. MJM 446, 578.

var. implicatum (Scribn.) Fern.

Occasional; open sand in backdune. MJM 690.

P. virgatum L. Switch Grass

var. spissum Linder.

Common; along roadsides and in open sand throughout backdune. MJM 589.

PHALARIS L.

P. arundinacea L. Reed-Canary Grass

Occasional; on dike surrounding South Pool. MJM 680.

PHLEUM L.

P. pratense L. Common Timothy

Common; fields and roadsides. MJM 491.

PHRAGMITES Trin.

P. australis (Cav.) Trin. ex. Steud. Reed Grass

(= P. communis Trin. in Fernald, 1950.)

Locally abundant; salt marshes and impoundments. MJM 809. (Taxonomy follows Clayton, 1968.)

POA L.

P. angustifolia L.

Occasional; open ground. Harris 12080 [NEBC].

P. annua L. Annual Bluegrass

Common; disturbed areas and waste places. MJM 408.

P. compressa L. Canada Bluegrass

Occasional; understory of thickets in backdune and disturbed areas. MJM 581, 669.

P. pratensis L. Kentucky Bluegrass

Occasional; understory of thickets in backdune. MJM 567.

PUCCINELLIA Parl.

P. distans (L.) Parl. Goosegrass

Rare; last collected in 1894. Robinson s.n., 14 June 1877 [PM].

P. fasciculata (Torr.) Bickn.

Rare; last collected by W. Oakes. Harris, 1975.

P. maritima (Huds.) Parl. Alkali-grass

Abundant; throughout salt marsh. MJM 674, 1118, 1193.

SECALE L.

S. cereale L. Rye

Common; fields throughout Refuge. MJM 707, 824, 1170.

SETARIA Beauv.

S. glauca (L.) Beauv. Foxtail

Occasional; fields and waste places. Harris 12475 [NEBC].

S. viridis (L.) Beauv. Green Foxtail

Occasional; fields and waste places. Harris 12388 [NEBC].

SPARTINA Schreb.

S. alterniflora Loisel. Saltwater Cordgrass

Abundant; salt marshes. MJM 645.

S. caespitosa A. A. Eaton

Occasional; upper edge of salt marsh, particularly large stand along Point Road. Taxonomic status uncertain. (See McDonnell and Crow, 1979.) MJM 799, 1285.

S. patens (Ait.) Muhl. Saltmeadow Grass

Abundant; throughout salt marsh. MJM 1191.

S. pectinata Link Freshwater Cordgrass

Frequent; along upper edge of salt marsh. MJM 489, 557.

SPOROBOLUS R. Br.

S. asper (Michx.) Kunth

Rare; open sand. Harris 13809 [NEBC].

VULPIA K. C. Gmel.

V. octoflora (Walt.) Rydb.

var. *tenella* (Willd.) Fern.

Rare; open sands. Harris, 1975.

ZIZANIA L.

Z. aquatica L. Wild Rice

Rare; last collected in 1934. Harris, 1975.

CYPERACEAE (Sedge Family)

BULBOSTYLIS (Kunth) C. B. Clarke

B. capillaris (L.) C. B. Clarke

var. capillaris

Occasional; disturbed areas and open sand, north end of island. MJM 1278.

var. crebra Fern.

Occasional. Harris, 1975.

CAREX L.

C. comosa Boott Sedge

Occasional; wet areas. St. John and White 534 [NEBC].

C. crinita Lam.

Common; wet areas throughout island. MJM 455, 569, 1154.

C. hormathodes Fern.

Occasional; wet areas. Sargent s.n., 11 July 1913 [NHA].

forma invisa (W. Boott) Fern.

Occasional; edge of fresh and brackish marshes. MJM 459.

C. pensylvanica Lam.

Abundant; forming dense mats in open sand and under pines. MJM 425, 986.

C. projecta Mackenz.

Occasional; wet swales. Harris 12557 [NEBC].

C. scoparia Schkuhr

Common; muddy shores of North Pool and Stage Island Pool. MJM 605, 1179.

C. silicea Olney

Frequent; open sand throughout island. MJM 419, 671, 774.

C. stipata Muhl.

Occasional; edge of small pool on Cross Farm Hill. MJM 1235.

CYPERUS L.

C. dentatus Torr.

Rare; wet areas. Pease 2894 [NEBC].

C. erythrorhizos Muhl.

Occasional; muddy shores of North Pool. MJM 838.

C. filicinus Vahl

Occasional; wet depressions in dunes, cranberry swales, and edge of South Pool. MJM 854, 909, 1306.

C. filiculmis Vahl

var. macilentus Fern.

Occasional; open sandy ground. MJM 514, 779.

C. grayii Torr.

Common; open sands in interdune and backdune. MJM 426, 676, 778.

C. strigosus L.

Common; edges of North and South Pools. MJM 836, 1332.

ELEOCHARIS R. Br.

E. obtusa (Willd.) Schultes — Spike Rush

Common; muddy shores of North Pool. MJM 606.

E. parvula (R. and S.) Link

Abundant; forming dense mats on mudflats surrounding North and South Pools. MJM 711, 864, 1251.

E. smallii Britt.

var. smallii

Common; shores of North and South Pools. MJM 608, 619.

var. major (Sonder) Seymour

(= E. palustris (L.) R. and S. var. major Sonder of Fernald, 1950.)

Occasional; cranberry swales between dunes. MJM 417. (Taxonomy follows Seymour, 1969.)

SCIRPUS L.

S. americanus Pers. — Sword-grass

Common; brackish marshes, southern end of island. MJM 458, 673, 714.

S. atrovirens Willd.

var. georgianus (Harper) Fern.

Occasional; muddy shores of Stage Island Pool and along edge of small pool on Stage Island. MJM 1150, 1182.

S. cyperinus (L.) Kunth — Wool-grass

Common; cranberry swales and marshes. MJM 597, 841.

S. maritimus L. — Salt Marsh Bulrush

var. fernaldi (Bickn.) Beetle

Common; forming dense stands in salt marsh. MJM 646.

S. paludosus Nels. Bayonet-grass

var. atlanticus Fern.

Common; upper border of salt marsh. MJM 528.

ARACEAE (Arum Family)

ACORUS L.

A. calamus L. Sweet Flag

Occasional; in ditch along road at southern end of island. Ahles 77530 [MASS].

ARISAEMA Mart.

A. atrorubens (Ait.) Blume Jack-in-the-pulpit

Rare; Grape Island, in open damp area near Fraxinus pennsylvanica stand. MJM 744.

LEMNACEAE (Duckweed Family)

LEMNA L.

L. minor L. Duckweed

Frequent; locally abundant in North Pool. MJM 452.

XYRIDACEAE (Yellow-Eyed Grass Family)

XYRIS L.

X. torta Sm. Yellow-eyed Grass

Occasional; cranberry swales between dunes. MJM 653, 753.

COMMELINACEAE (Spiderwort Family)

COMMELINA L.

C. communis L. Dayflower

Occasional; disturbed areas, north end of island. MJM 1307.

TRADESCANTIA L.

T. virginiana L. Spiderwort

Locally abundant; Grape Island, apparently escaped cultivation. MJM 1135.

JUNCACEAE (Rush Family)

JUNCUS L.

J. acuminatus Michx. Rush

Common; cranberry swales and lower banks of dike surrounding North and South Pools. MJM 571, 1327.

J. articulatus L.

Rare; wet hollows between dunes. St. John 686 [NEBC].

var. obtusatus Engelm.

Rare; damp sand, last collected in 1903. Forbes 945. [NEBC].

J. balticus Willd.

var. littoralis Engelm.

Frequent; wet depressions between dunes and in marshes. MJM 398, 558.

J. bufonius L. Toad Rush

Occasional; edge of wet dune hollows and along paths. MJM 565, 570.

J. canadensis J. Gay

Occasional; wet depressions in dunes and on upper edge of salt marsh at Cross Farm Hill. MJM 713, 1364.

forma conglobatus Fern.

Occasional; brackish to saline marshes. White 550 [NEBC].

J. effusus L. Soft Rush

var. solutus Fern. and Wieg.

Occasional; damp areas along edge of South Pool and in cranberry swales between dunes. MJM 512, 624.

J. gerardi Loisel. Black Grass

Abundant; upper edge of salt marsh. MJM 286.

J. greenei Oakes and Tuckerm.

Common, wet hollows in dunes and along edges of ponds. MJM 414, 670.

J. tenuis Willd.

Occasional; along edge of paths and parking lots. MJM 391, 642.

LILIACEAE (Lily Family)

ALLIUM L.

A. vineale L. Field-Garlic

Occasional; southern end of dike surrounding South Pool. MJM 511.

ASPARAGUS L.

A. officinalis L. Garden Asparagus

Occasional; naturalized, thickets throughout backdune. MJM 427.

CONVALLARIA L.

C. majalis L. Lily-of-the-valley

Cultivated; persistent on Grape Island. MJM 749, 1137.

HEMEROCALLIS L.

H. lilio-asphodelus L. Yellow Day Lily

(= H. flava L. in Fernald, 1950.)

Cultivated; persistent on Grape Island. MJM 1134. (Taxonomy follows Voss, 1966.)

H. fulva L. Common Orange Day Lily

Cultivated; small clump remains near ruins of old foundation just west of parking lot 1. MJM 482.

LILIUM L.

L. philadelphicum L. Wild Orange-red Wood-Lily

Rare; small clump in Hellcat Swamp. MJM 641.

L. lancifolium Thunb. Tiger-Lily

(= L. tigrinum L. in Fernald, 1950.)

Cultivated; persistent near remains of old foundation just west of parking lot 1. MJM 483. (Taxonomy follows Voss, 1972.)

MAIANTHEMUM Weber

M. canadense Desf. False Lily-of-the-valley

Occasional; under pines and locally abundant under Prunus-Rosa thicket in backdune between parking lots 10 and 11. MJM 264, 1009, 1050.

POLYGONATUM Mill.

P. pubescens (Willd.) Pursh Solomon's Seal

Occasional; sunken forests in backdune, particularly common along Kettle Hole Trail. MJM 268, 999.

SMILACINA Desf.

S. stellata (L.) Desf. Starry Spikenard

Abundant; throughout backdune under shrub thickets. MJM 250, 997.

SMILAX L.

S. herbacea L. Carrion Flower

Rare; shrub thickets on Cross Farm Hill and along Kettle Hole Trail. MJM 728, 1076.

S. rotundifolia L. Common Greenbrier

Abundant; throughout backdune, in shrub thickets. MJM 349, 635.

YUCCA L.

Y. smalliana Fern. Adam's Needle

Cultivated; persistent around Subheadquarters. MJM 1281.

IRIDACEAE (Iris Family)

IRIS L.

I. prismatica Pursh — Slender Blue Flag

Rare; wet areas. Harris, McGregor and Schweinfurth 12701 [NEBC].

I. pseudacorus L. — Yellow Iris

Occasional; escaped cultivation, occurs in ditches along road at southern end of island. MJM 1018.

I. versicolor L. — Blue Flag

Common; marshes, wet meadows, and in ditches along road through Refuge. MJM 299, 310, 1142.

SISYRINCHIUM L.

S. montanum Greene — Blue-eyed Grass

Occasional; fields and roadsides. MJM 1115.

ORCHIDACEAE (Orchid Family)

CALOPOGON R. Br.

C. tuberosus (L.) BSP. — Swamp Pink

(= C. pulchellus (Salisb.) R. Brown in Fernald, 1950.)

Rare; in damp places among dune. Single collection 1875. Robinson and Sears s.n., Sept. 1875 [PM]. Presumed extirpated. (Taxonomy follows Voss, 1966.)

EPIPACTIS Sw.

E. helleborine (L.) Crantz — Helleborine

Rare; on rich banks of Grape Island. MJM 747.

SALICACEAE (Willow Family)

POPULUS L.

P. alba L. White Poplar

Occasional; escaped from cultivation and has become naturalized on Stage Island and in Hellcat Swamp. MJM 1041.

P. grandidentata Michx. Large-Toothed Aspen

Occasional; Hellcat Swamp. MJM 768.

P. tremuloides Michx. Trembling Aspen

Abundant; throughout island forming thickets in wet depressions between dunes. MJM 267, 359.

SALIX L.

S. alba L. White Willow

var. *vitellina* (L.) Stokes

Occasional; moist areas and along edge of road, large trees. MJM 497.

S. babylonica L. Weeping Willow

Cultivated; persistent on Stage Island. MJM 1043.

S. bebbiana Sarg. Long-beaked Willow

Occasional; dune hollows. St. John 838 [NEBC].

S. discolor Muhl. Large Pussy-Willow

Common; wet thickets and along edge of Stage Island. MJM 989, 990, 1029.

S. gracilis Anderss.

var. *textoris* Fern.

Common; thickets surrounding cranberry swales. MJM 360.

S. lucida Muhl. Shining Willow

Occasional; dune hollows St. John 714 [NEBC].

S. nigra Marsh. Black Willow

Common; edge of pools and moist thickets. MJM 362, 451.

X S. subsericea (Anderss.) Schneid.

Rare; thickets. Harris, McGregor and Schweinfurth 12741 [NEBC].

S. rigida Muhl.

Occasional; wet areas along road, southern end of island. MJM 1031.

MYRICACEAE (Wax-Myrtle Family)

MYRICA L.

M. gale L. Sweet Gale

Occasional; in wet low areas, common on northwest corner of Cross Farm Hill. MJM 732.

M. pensylvanica Loisel. Bayberry

Abundant; throughout island. MJM 374.

JUGLANDACEAE (Walnut Family)

CARYA Nutt.

C. ovata (Mill.) K. Koch Shagbark Hickory

Occasional; small colonies at the extreme southern tip of island in State Park, on Cross Farm Hill and Grape Island. MJM 753, 1264.

BETULACEAE (Birch Family)

ALNUS B. Ehrh.

A. rugosa (Du Roi) Spreng. Alder

Common; forming dense thickets in wet areas, locally abundant at southeast corner of Stage Island Pool. MJM 985.

A. serrulata (Ait.) Willd. Common Alder

Common; forming thickets in moist areas throughout island. MJM 444, 538.

BETULA L.

B. nigra L. River Birch

Rare; swale in dunes at northern boundary of the Dune Natural Area. MJM 1383.

B. papyrifera Marsh. Paper Birch

Occasional; Hellcat Swamp. MJM 551, 1016.

B. populifolia Marsh. Gray Birch

Occasional; wet depressions throughout backdune. MJM 418, 552, 1056.

FAGACEAE (Beech Family)

QUERCUS L.

Q. rubra L. Red Oak

Occasional; in back dune. Harris 12740 [NEBC].

Q. velutina Lam. Black Oak

Common; throughout backdune. Many aberrant leaf forms

possibly due to the effects of salt spray. MJM 547, 632, 770.

ULMACEAE (Elm Family)

CELTIS L.

C. occidentalis L. Hackberry

var. pumila (Pursh) Gray

Occasional; in sunken forest behind High Sandy and on backdune ridge. MJM 381, 481, 573.

ULMUS L.

U. americana L. American Elm

Rare; few trees scattered throughout southern tip of island and on Grape Island. MJM 529, 1212, 1216.

URTICACEAE (Nettle Family)

URTICA L.

U. dioica L. Stinging Nettle

Rare; few plants in sunken forest behind High Sandy. MJM 575.

ARISTOLOCHIACEAE (Birthwort Family)

ARISTOLOCHIA L.

A. durior Hill Dutchman's-Pipe

Cultivated; persistent on Grape Island. MJM 755.

POLYGONACEAE (Buckwheat Family)

FAGOPYRUM Mill.

F. sagittatum Gilib. — Buckwheat

Occasional; Harris 12525 [NEBC].

POLYGONELLA Michx.

P. articulata (L.) Meisn. — Jointweed

Frequent; throughout island in open sand. MJM 856, 900, 1360.

POLYGONUM L.

P. aviculare L. — Knotweed

var. aviculare

Common; in waste places and along parking lots. MJM 800, 1169.

var. littorale (Link) W. D. J. Koch

Occasional; along shore. Harris 12399 [NEBC].

P. cilinode Michx. — Climbing Buckwheat

Rare; along Kettle Hole Trail and in sunken forest behind High Sandy. MJM 380, 572.

P. cuspidatum Sieb. and Zucc. — Japanese Knotweed

Occasional; on north end of Grape Island. MJM 1129.

P. lapathifolium L. — Smartweed

Occasional; in goose field adjacent to North Pool. MJM 827.

P. pensylvanicum L. — Pinkweed

var. laevigatum Fern.

Occasional; wet areas. Harris 12451 [NEBC].

P. persicaria L. Lady's-Thumb

Occasional; in goose field adjacent to North Pool. MJM 828.

P. prolificum (Small) Robins. Smartweed

Occasional; upper edge of salt marsh on north side of Stage Island. MJM 1343.

P. punctatum Ell.

var. leptostachyum (Meisn.) Small

Occasional; in wet areas, common along Hellcat Swamp Trail on east side of road. MJM 870.

P. scandens L. Climbing False Buckwheat

Occasional; growing on Bayberry along dike out to tower at Hellcat Swamp and on Phragmites along shore of Stage Island Pool. MJM 1331, 1345.

RUMEX L.

R. acetosella L. Sheep Sorrel

Common; disturbed areas, parking lots, and on dikes. MJM 294, 914, 1071.

R. crispus L Yellow Dock

Common; sandy gravelly shores and disturbed areas. MJM 287, 516, 1210.

R. maritimus L. Golden Dock

var. fueginus (Phil.) Dusen

Occasional; along shores of Stage Island and South Pools. MJM 1167, 1330.

R. mexicanus Meisn.

Adventive; disturbed areas on north end of island. MJM 1273.

R. pallidus Bigel. White Dock

Rare; on edge of salt marsh. Single collection 1913. St. John 1106 [NEBC].

CHENOPODIACEAE (Goosefoot Family)

ATRIPLEX L.

A. arenaria Nutt. Seabeach-Orach

Rare; borders of salt marsh. Harris 12522 [NEBC].

A. patula L.

var. hastata (L.) Gray

Common; on brackish shores. MJM 908, 1370.

var. littoralis (L.) Gray

Occasional; salt marshes. Pease 3075 [NEBC].

BASSIA All.

B. hirsuta (L.) Aschers.

Frequent; along upper border of salt marsh. MJM 1172, 1352.

CHENOPODIUM L.

C. album L. Pigweed

Occasional; disturbed areas. MJM 1351.

C. leptophyllum Nutt.

Rare; sandy soil along road just north of Hellcat Swamp. MJM 1319.

C. rubrum L. Coast-Blite

Rare; muddy shore of South Pool. MJM 905.

SALICORNIA L.

S. bigelovii Torr. Dwarf Saltwort

Occasional; salt marshes. Harris, 1975.

S. europaea L. Samphire

Frequent; salt marshes. MJM 1260, 1348, 1353.

SALSOLA L.

S kali L. Saltwort

Common; along sandy shores. MJM 561, 875.

SUAEDA Forsk.

S. linearis (Ell.) Moq. Sea-blite

Common; upper edges of salt marsh. MJM 1270.

S. maritima (L.) Dumort. Sea-blite

Common; upper edges of salt marshes and gravelly beaches. MJM 1355.

S. richii Fern.

Common; upper edges of salt marsh. Eaton, and Ferguson 5882 [NEBC]..

AMARANTHACEAE (Amaranth Family)

ACNIDA L.

A. cannabina L. Water-Hemp

Common; along shores and on upper edges of salt marsh. MJM 1284, 1340.

AMARANTHUS L.

A. albus L. Tumbleweed

Occasional; waste places and disturbed areas. Harris 12526 [NEBC].

PHYTOLACCACEAE (Pokeweed Family)

PHYTOLACCA L.

P. americana L. Pokeweed

Occasional; clearings in thicket north of dike surrounding North Pool. MJM 503.

AIZOACEAE (Carpetweed Family)

MULLUGO L.

M. verticillata L. Carpetweed

Frequent; disturbed areas, usually adjacent to paths and parking areas. MJM 611, 688.

CARYOPHYLLACEAE (Pink Family)

ARENARIA L.

A. lateriflora L. Grave Sandwort

Abundant; growing under shrub thickets and in sunken forests. MJM 302, 421, 566.

A. serpyllifolia L. Thyme-leaved Sandwort

Occasional; disturbed areas on Stage Island. MJM 1206.

A. peploides L. Seabeach-Sandwort

Rare; last collected in 1915. Mackintosh s.n., 17 June 1915 [NEBC]. Bigelow (1824, p. 181) specifically mentions the occurrence of this plant on Plum Island, stating it "...forms large crowded tufts resembling

islets." Possibly extirpated.

CERASTIUM L.

C. vulgatum L. Common Mouse-ear Chickweed

Common; in fields and under shrub thickets. MJM 517, 1023, 1207.

DIANTHUS L.

D. armeria L. Deptford Pink

Common; on Stage Island and in storage area across from Subheadquarters. MJM 403, 526, 1173.

LYCHNIS L.

L. alba Mill. White Campion

Occasional; field on Cross Farm Hill. MJM 1243.

L. flos-cuculi L. Ragged-Robin

Occasional; on dikes surrounding North and South Pools. MJM 1053.

SAGINA L.

S. procumbens L. Birdseye

Occasional; disturbed areas, common in storage area across from Subheadquarters. MJM 411.

SAPONARIA L.

S. officinalis L. Soapwort

Common; disturbed areas, roadsides, and vacant lots. MJM 668, 701, 1272.

SCLERATHUS L.

S. annuus L. Knawel

Occasional; disturbed areas. Ahles 77611 [MASS].

SILENE L.

S. antirrhina L. Sleepy Catchfly

Occasional; fields and open areas. Harris 12076 [NEBC].

S. cucubalus Wibel Bladder Campion

Common; field adjacent to Subheadquarters. MJM 499.

S. dichotoma Ehrh. Forking Catchfly

Occasional; in field on Cross Farm Hill. MJM 469.

SPERGULARIA J. and C. Presl

S. canadensis (Pers.) Don

Occasional; salt marsh north of Stage Island and marsh east of Grape Island. MJM 502, 1269.

S. marina (L.) Griseb.

var. marina

Frequent; upper edges of salt marsh. MJM 1189.

var. leiosperma (Kindb.) Gurke

Occasional; upper edges of salt marsh and gravelly shores. MJM 831, 1242, 1354.

S. rubra (L.) J. and C. Presl. Sand-Spurrey

Common; disturbed areas, parking lots, and along dike surrounding North and South Pools. MJM 507, 785, 1168.

STELLARIA L.

S. graminea L. Common Stitchwort

Occasional; disturbed areas and along roads. MJM 300, 1025.

S. longifolia Muhl.

Occasional; southern end of island. Harris 12082 [NEBC].

RANUNCULACEAE (Crowfoot Family)

ANEMONE L.

A. cylindrica Gray Thimbleweed

Rare; Hellcat swamp along boardwalk. Ahles 77588 [MASS].

CLEMATIS L.

C. virginiana L. Virgin's-bower

Rare; southern end of island. Harris 12417 [NEBC].

PAEONIA L.

P. lactiflora Pall. Peony

Cultivated; persistent on Grape Island. MJM 1263.

RANUNCULUS L.

R. abortivus L. Kidneyleaf Buttercup

Occasional; in Hellcat Swamp and along Kettle Hole Trail. MJM 1012, 1077.

R. acris L. Common Buttercup

Rare; east side of Grape Island on rich slope. MJM 751.

R. cymbalaria Pursh — Seaside Crowfoot

Rare; along seashore. Last collected in 1924. Mackintosh s.n., 13 Sept. 1924 [NEBC].

R. repens L. — Creeping Buttercup

Occasional; fields on Stage Island and Cross Farm Hill. MJM 1036, 1236.

R. sceleratus L. — Cursed Crowfoot

Rare; wet areas along boardwalk through Hellcat Swamp on east side of road. MJM 366, 681.

THALICTRUM L.

T. polygamum Muhl. — Tall Meadow-Rue

Occasional; on Grape Island and along road north of parking lot 7. MJM 750, 1027.

BERBERIDACEAE (Barberry Family)

BERBERIS L.

B. thunbergii DC. — Japanese Barberry

Rare; escaped cultivation growing on rich slopes of Grape Island. MJM 1266.

B. vulgaris L. — Common Barberry

Frequent; throughout backdunes and on Stage Island. MJM 364, 858, 1037.

LAURACEAE (Laurel Family)

SASSAFRAS Nees

S. albidum (Nutt.) Nees — Sassafras

Occasional; locally abundant just north of Subheadquarters on west side of road and on Grape Island. MJM 350, 1068, 1132.

CRUCIFERAE (Mustard Family)

ARABIS L.

A. drummondi Gray

Common; throughout backdune, particularly on west slope of backdune ridge. MJM 478, 568, 998.

ARMORACIA Gaertn., Mey. and Scherb.

A. lapathifolia Gilib. Horseradish

Occasional; large stand in field adjacent to Subheadquarters. MJM 328.

BRASSICA L.

B. kaber (DC.) L. C. Wheeler Charlock

var. pinnatifida (Stokes) L. C. Wheeler

Occasional; in field on Stage Island. MJM 1202.

B. nigra (L.) Koch Black Mustard

Common; disturbed areas and fields, Hellcat Swamp, Cross Farm Hill, and Grape Island. MJM 684, 1131, 1238.

B. rapa L. Bird's Rape

Occasional; disturbed areas. Harris 12093 [NEBC].

CAKILE Hill

C. edentula (Bigel.) Hook. Sea-Rocket

Common; along beach and wash over fans through foredune. MJM 559, 873.

LEPIDIUM L.

L. campestre (L.) R. Br. Cow-Cress

Occasional; in field on Cross Farm Hill and along path to tower at Hellcat Swamp. MJM 315, 326, 1021.

L. virginicum L. Poor-man's Pepper

Frequent; throughout island, disturbed areas, roadsides and open fields. MJM 301, 506, 601.

RORIPPA Scop.

R. islandica (Oeder) Borbas Yellow Cress

var. fernaldiana Butt. and Abbe

Rare; single collection 1888. Sears s.n., 9 July 1888 [PM].

RAPHANUS L.

R. raphanistrum L. Wild Radish

forma sulphureus (Babey) Hayek

Common; along shores and in wash over fans through the foredune. MJM 1286.

SISYMBRIUM L.

S. altissimum L. Tumble Mustard

Occasional; disturbed areas. MJM 336, 1203.

THLASPI L.

T. arvense L. Field Penny-cress

Occasional; along east shore of Grape Island. MJM 1267.

DROSERACEAE (Sundew Family)

DROSERA L.

D. intermedia Hayne — Sundew

Occasional; growing in dense mats in cranberry swales between dunes. MJM 430, 651, 677.

CRASSULACEAE (Orpine Family)

SEDUM L.

S. purpureum (L.) Link — Garden Orpine

Occasional; vacant lots and waste places, northern tip of island. MJM 1277.

SAXIFRAGACEAE (Saxifrage Family)

RIBES L.

R. hirtellum Michx.

Common; throughout backdune in shrub thickets and edges of wet depressions. MJM 385, 477, 1003.

R. sativum Syme — Garden Currant

Occasional; escaped cultivation, persistent on rich slopes of Grape Island. MJM 1268.

ROSACEAE (Rose Family)

AMELANCHIER Medic.

A. canadensis (L.) Medic. — Shadbush

Frequent; forming thickets throughout backdunes. MJM 433, 994, 1213.

A. laevis Wieg.

Occasional; in shrub thickets in backdune. Harris, McGregor and Schweinfurth 12736 [NEBC].

A. sanguinea Pursh DC.

Rare; thickets at southern end of island. Harris, McGregor and Schweinfurth 12684 [NEBC]. On Massachusetts rare and endangered species list, see Coddington and Field, 1978.

A. stolonifera Wieg.

Common; shrub thickets in wet swales and open sands in backdune. MJM 252, 476, 996.

CRATAEGUS L.

C. chrysocarpa Ashe — Hawthorn

Occasional; along road at southern end of island and on Cross Farm Hill. MJM 394, 715.

FRAGARIA L.

F. virginiana Duchesne — Strawberry

Occasional; Stage island and wet swale in dunes north of Camp Sea Haven. MJM 367, 1045.

GEUM L.

G. canadense Jacq. — Avens

Occasional; along boardwalk at Hellcat Swamp and on Cross Farm Hill. MJM 638, 719.

POTENTILLA L.

P. argentea L. — Silvery Cinquefoil

Common; disturbed areas and on dikes surrounding North and South Pools. MJM 412, 501, 1072.

P. arguta Pursh — Tall Cinquefoil

Occasional; Harris 12056 [NEBC].

P. canadensis L. Cinquefoil

Common; disturbed areas and along dikes surrounding North and South Pools. MJM 371, 1017.

P. egedei Wormsk.

var. groenlandica (Tratt.) Polunin

Frequent; upper borders of salt marsh. MJM 274, 648.

P. norvegica L.

Occasional; on edge of dike surrounding North and South Pools and on Cross Farm Hill. MJM 622, 720.

P. recta L.

Occasional; along roadsides and on edge of North Pool. MJM 438, 1140.

P. simplex Michx. Old Field Cinquefoil

Occasional; in meadow on Stage Island. MJM 1034.

P. tridentata Ait. Three-leaved Cinquefoil

Rare; Bar Head. Harris, McGregor and Schweinfurth 12693 [NEBC].

PRUNUS L.

P. maritima Marsh. Beach Plum

Abundant; throughout island, particularly abundant on backdune ridge. MJM 254, 333.

P. pensylvanica L. f. Pin Cherry

Common; thickets throughout backdune. MJM 357, 866, 1011.

P. serotina Ehrh. Black Cherry

Abundant; dominant tree species in forest behind backdune ridge. MJM 353.

P. virginiana L. Choke Cherry

Occasional; throughout backdune, in shrub thickets. MJM 261, 354.

PYRUS L.

P. aucuparia (L.) Gaertn. European Mountain Ash

Occasional; one large tree in upland area of Hellcat Swamp, west side of road and in thickets at southern tip of island. MJM 633.

P arbutifolia (L.) L. f. Red Chokeberry

Frequent; wet swales in dunes and thickets at southern end of island. MJM 802, 1022, 1057.

P. communis L. Pear

Cultivated; persistent on Grape Island. MJM 1262.

P. floribunda Lindl. Purple Chokeberry

Occasional, wet swales in dunes. MJM 596, 802b.

P. malus L. Apple

Cultivated; persistent at southern end of island and on Stage Island. MJM 1030, 1221.

P. melanocarpa (Michx.) Willd. Black Chokeberry

Occasional; shrub thickets at southern end of island, particularly around Stage Island Pool. MJM 1381.

P. prunifolia Willd. Crab Apple

Cultivated; persistent at southern end of island. MJM 452a.

ROSA L.

R. carolina L. Rose

Frequent; forming dense thickets in backdune. MJM 448, 591, 700.

R. multiflora Thunb.

Occasional; thickets. Ahles 77637. [MASS].

R. palustris Marsh.

Occasional; wet thickets at southern end of island. Harris, McGregor and Schweinfurth 12695 [NEBC].

R. rugosa Thunb. Beach Rose

Occasional; throughout interdune. MJM 308, 309.

R. virginiana Mill. Rose

Common; forming thickets in backdune and on Stage Island. MJM 1162.

RUBUS L.[4]

R. allegheniensis Porter Sow-teat Blackberry

Common; in thickets on Cross Farm Hill and Grape Island. MJM 760.

R. arenicola Blanch.

Common; southern end of island. MJM 313.

R. flagellaris Willd.

Common; wooded depressions between dunes and along edge of road. MJM 1085. (Hodgdon and Steele 16397 [NHA], population collections.)

[4]Taxonomy of those species in the subgenus Eubatus follows that of Hodgdon and Steele, 1966.

R. hispidus L.

Occasional; thickets. Ahles 77637 [MASS].

R. idaeus L. Raspberry

var. canadensis Richards.

Common; wooded depressions between dunes and on Grape Island. MJM 740, 1122.

var. strigosus (Michx.) Maxim.

Common; thickets in backdune and along boardwalk through Hellcat Swamp, east side of road. MJM 767.

R. recurvans Blanch

Rare; Harris 12107 [NEBC].

R. recurvicaulis Blanch.

Common; open areas in backdune. MJM 590. (Hodgdon and Steele 15562 [NHA], population collection.)

R. semisetosus Blanch.

Common; wooded thickets between dunes and on Stage Island. MJM 543, 818. (Hodgdon and Steele 16398 [NHA], population collection.)

R. sererus Brain. (?)

Occasional; southern end of island along east side of road. Hodgdon and Steele 15543 [NHA], population collection.

R. jaysmithii Bailey

(= R. tetricus Bailey in Fernald, 1950)

Common; along edge of road and in thickets throughout backdune. MJM 519, 343.

R. vermontanus Blanch.

Occasional; along roadside and in shrub thickets at southern end of island. MJM 1226. (Hodgdon and Steele 16401 [NHA], population collection.)

SANGUISORBA L.

S. canadensis L. Canadian Burnet

Occasional; wet area between road and salt marsh just north of Subheadquarters. MJM 1308

SPIRAEA L.

S. latifolia (Ait.) Borkh. Meadow Sweet

Common; along edge of wet swales and in thickets at southern end of island. MJM 361, 449.

S. tomentosa L. Steeple-Bush

Common; along edge of wet swales and bordering North Pool. MJM 521, 628.

LEGUMINOSAE (Pulse Family)

APIOS Medic.

A. americana Medic. Groundnut

Rare; shrub thicket along west side of road in Hellcat Swamp. MJM 1316.

DALEA Juss.

D. alopecuroides Willd. Foxtail Dalea

Rare; Hellcat swamp in sandy soil, single collection 1950. Snyder s.n., 3 Sept. 1950 [PM]. (See Snyder, 1950.)

LATHYRUS L.

L. japonicus Willd. Beach Pea

Abundant; forming dense mats on foredune ridge. MJM 339, 686, 1075.

LESPEDEZA Michx.

L. capitata Michx. Bush Clover

var. capitata

Occasional; in field south of parking lot 5 (Hellcat Swamp). MJM 1315.

var. vulgaris T. and G.

Occasional. Harris 12481 [NEBC].

LOTUS L.

L. corniculatus L. Birdsfoot-trefoil

Occasional; along edge of road through Refuge. MJM 587, 1073.

MEDICAGO L.

M. lupulina L.

var. lupulina

Occasional; waste places. Harris 12059 [NEBC].

var. glandulosa Neilr.

Occasional; waste places. Harris 12086 [NEBC]..

MELILOTUS Mill.

M. alba Desr. White Sweet Clover

Occasional; along roadsides and in meadow on Cross Farm Hill. MJM 402, 468.

M. officinalis (L.) Lam. Yellow Sweet Clover

Occasional; meadow on Cross Farm Hill. MJM 327, 467

ROBINIA L.

R. pseudo-acacia L. Black Locust

Occasional; along edge of road at southern end of island. MJM 393, 771.

TRIFOLIUM L.

T. agrarium L. Yellow Clover

Occasional; open ground. Ahles 77620 [MASS].

T. arvense L. Rabbit-Foot-Clover

Common; disturbed areas, meadows, and goose field adjacent to North Pool. MJM 1147, 479.

T. hybridum L. Alsike Clover

Occasional; fields and roadsides. Harris 12115 [NEBC].

T. pratense L. Red Clover

Occasional; meadow on Cross Farm Hill. MJM 329.

T. repens L. White Clover

Occasional; fields and roadside. Harris 12058 [NEBC].

VICIA L.

V. dasycarpa Ten. Vetch

Occasional; locally abundant in meadow on Cross Farm Hill. MJM 536.

V. tetrasperma (L.) Moench Vetch

Occasional; in field adjacent to South Pool. MJM 513.

V. villosa Roth Hairy Vetch

Occasional; locally abundant in meadow on Cross Farm Hill. MJM 305, 325.

forma albiflora (Schur) Gams

Occasional; meadow on Cross Farm Hill. MJM 324.

OXALIDACEAE (Wood-sorrel Family)

OXALIS L.

O. europaea Jord. Wood-Sorrel

Rare. Harris 12653 [NEBC].

O. stricta L. Wood-Sorrel

Common; disturbed areas, thickets and meadows. MJM 413, 625, 736.

GERANIACEAE (Geranium Family)

GERANIUM L.

G. maculatum L. Wild Cranesbill

Rare; along road through Refuge. MJM 355.

G. robertianum L. Herb-Robert

Rare; Hellcat Swamp along trail under Black Gum trees. MJM 434.

SIMAROUBACEAE (Quassia Family)

AILANTHUS Desf.

A. altissima (Mill.) Swingle Tree-of-Heaven

Rare; two trees, one along side of house on Stage Island, the other in open sand at the extreme southern tip of the island. MJM 991, 1046.

EUPHORBIACEAE (Spurge Family)

EUPHORBIA L.

E. cyparissias L. Cypress Spurge

Occasional; south side of Stage Island. MJM 1049.

E. esula L. Leafy Spurge

Common; disturbed areas and along roadsides. MJM 306.

E. polygonifolia L. Seaside Spurge

Frequent; open sands, throughout island. MJM 650, 685, 808.

E. supina Raf.

Occasional; waste places and along paths. MJM 409, 442.

ANACARDIACEAE (Cashew Family)

RHUS L.

R. copallina L. Shining Sumac

Common; along edge of road, open areas, and shrub thickets. MJM 441, 1146, 1218.

R. glabra L. Smooth Sumac

Occasional; along roadsides. MJM 1217.

R. typhina L. Staghorn Sumac

Common; disturbed areas and along roadsides, throughout island. MJM 436.

TOXICODENDRON Miller

T. radicans (L.) Kuntze — Poison Ivy

ssp. radicans

(= Rhus radicans L. in Fernald, 1950)

Abundant; throughout island. MJM 334, 340. (Taxonomy follows Gillis, 1971.)

AQUIFOLIACEAE (Holly Family)

ILEX L.

I. verticillata (L.) Gray — Winterberry

var. verticillata

Frequent; wet swales and shrub thickets. MJM 375, 556, 634.

var. padifolia (Willd.) T. and G.

Occasional; wet swales. MJM 358.

CELASTRACEAE (Staff-tree Family)

CELASTRUS L.

C. orbiculatus Thunb. — Bittersweet

Common; Grape Island. MJM 757, 1123.

C. scandens L. — Bittersweet

Common; forming dense stands in thickets at extreme southern tip of island and on Grape Island. MJM 758, 1220.

ACERACEAE (Maple Family)

ACER L.

A. negundo L. — Box Elder

Occasional; northern end of island. MJM 1280.

A. rubrum L. — Red Maple

Frequent; wet swales, backdune, and on Grape Island. MJM 341, 752, 1265.

A. saccharum Marsh. — Sugar Maple

Cultivated; persistent next to cottage on Stage Island. MJM 1208.

BALSAMINACEAE (Touch-me-not Family)

IMPATIENS L.

I. capensis Meerb. — Touch-me-not

Occasional; wet edges of Stage Island and Cross Farm Hill. MJM 530, 729.

RHAMNACEAE (Buckthorn Family)

RHAMNUS L.

R. frangula L. — Alder Buckthorn

Frequent; wet swales and shrub thickets. MJM 595. 1225.

VITACEAE (Vine Family)

PARTHENOCISSUS Planch.

P. quinquefolia (L.) Planch. Virginia Creeper

Frequent; sunken forests and swales. MJM 344.

VITIS L.

V. labrusca L. Fox Grape

Frequent; sunken forests and thickets. MJM 376, 541, 546.

V. riparia Michx. Frost Grape

Frequent; sunken forests, thickets and along edge of meadows. MJM 317, 537, 533.

TILIACEAE (Linden Family)

TILIA L.

T. neglecta Spach Basswood

Common; along shores of drumlins at southern end of island. MJM 532, 1133, 1121.

GUTTIFERAE (St. John's-wort Family)

HYPERICUM L.

H. boreale (Britt.) Bickn. St. John's-wort

Common; wet cranberry swales between dunes and in Hellcat Swamp. MJM 652, 764, and 833.

H. gentianoides (L.) BSP. Orange-Grass

Common; open sand and disturbed areas. MJM 682, 801, 874.

H. majus (Gray) Britt.

Occasional; shrub borders of North Pool. MJM 609.

H. perforatum L. Common St. John's-wort

Common; open fields and roadsides. MJM 405, 663.

H. virginicum L. Marsh St. John's-wort

Occasional; edges of North Pool and Stage Island Pool. MJM 629, 662.

CISTACEAE (Rockrose Family)

HELIANTHEMUM Mill.

H. canadense (L.) Michx. Frostweed

Rare; in field south of parking lot 5 (Hellcat Swamp) and along Pines Nature Trail. MJM 515, 703.

HUDSONIA L.

H. tomentosa Nutt. False Heather

Abundant; forming large mats in open sand. MJM 251, 307.

LECHEA L.

L. maritima Leggett Pinweed

Abundant; open sands throughout island. MJM 848, 872, 1361.

VIOLACEAE (Violet Family)

VIOLA L.

V. fimbriatula Sm. Violet

Occasional; rich soil on Bar Head. Harris 12669 [NEBC].

V. lanceolata L. Lance-leaved Violet

Occasional; moist depression in field adjacent to Subheadquarters. MJM 291.

LYTHRACEAE (Loosestrife Family)

LYTHRUM L.

L. hyssopifolia L. Hyssop-leaved Loosestrife

Rare; muddy shores of South Pool. MJM 1247.

L. salicaria L. Purple Loosestrife

Abundant; damp shores throughout island, most abundant species in North Pool, actively colonizing other marshes. MJM 487, 603, 1155.

NYSSACEAE (Sour Gum Family)

NYSSA L.

N. sylvatica Marsh. Black Gum

Occasional; forming small colonies in backdune along Kettle Hole Trail, in the Dune Natural Area, and in Hellcat Swamp. MJM 351, 379.

ONAGRACEAE (Evening-Primrose Family)

CIRCAEA L.

C. alpina L. Enchanter's Nightshade

Occasional; east bank of Grape Island. MJM 746.

EPILOBIUM L.

E. angustifolium L. Fireweed

Rare; on dike surrounding North Pool. D. C. W. s.n., 12 July 1971 [PRWR Herbarium].

E. hirsutum L. Willow Herb

Occasional; roadsides and waste places. Harris 12406 [NEBC].

E. glandulosum Lehm. Willow Herb

var. adenocaulon (Haussk.) Fern.

Common; moist thickets and borders of North and South Pools. MJM 730, 678, 1257.

LUDWIGIA L.

L. palustris (L.) Ell. Water Purslane

var. americana (DC.) Fern. and Grisc.

Occasional; muddy banks of North Pool. MJM 1144.

OENOTHERA L.

O. biennis L. Evening Primrose

Common; along roadsides, in fields, and disturbed areas. MJM 689, 1198, 1290.

O. perennis L.

Occasional. Harris, McGregor and Schweinfurth 12665 [NEBC].

O. parviflora L.

Occasional; open sands in backdune. MJM 1310.

HALORAGACEAE (Water Milfoil Family)

MYRIOPHYLLUM L.

M. humile (Raf.) Morong Water Milfoil

forma natans (DC.) Fern.

Rare; muddy bottom of shallow pool in Dune Natural Area, east of North Pool. MJM 1325.

ARALIACEAE (Ginseng Family)

ARALIA L.

A. hispida Vent — Bristly Sarsaparilla

Occasional; open sand, field south of parking lot 4 (Hellcat Swamp) and adjacent to small pool in dunes just east of parking lot 6. MJM 706, 1259.

A. nudicaulis L. — Wild Sarsaparilla

Frequent; forming dense clones under shrub thickets in backdune. MJM 269, 574, 995.

UMBELLIFERAE (Parsley Family)

CICUTA L.

C. maculata L. — Spotted Cowbane

Occasional; moist ground at northeast corner of Cross Farm Hill and edge of Stage Island Pool. MJM 735, 1216, 1231.

COELOPLEURUM Ledeb.

C. lucidum (L.) Fern.

Rare; upper border of salt marsh just west of parking lot 2. MJM 1117.

DAUCUS L.

D. carota L. — Wild Carrot

Common; roadsides and meadows. MJM 616, 654.

LIGUSTICUM L.

L. scothicum L. Scotch Lovage

Occasional; gravelly shores and upper border of salt marsh. MJM 727, 1209.

ERICACEAE (Heath Family)

ARCTOSTAPHYLOS Adans.

A. uva-ursi (L.) Spreng. Bearberry

var. coactilis Fern. and Macbr.

Occasional; mostly under Pitch Pines and in open sand, particularly abundant along the Pines Nature Trail. MJM 271, 424, 1010.

GAYLUSSACIA HBK.

G. baccata (Wang.) K. Koch Huckleberry

Common; small patches scattered throughout backdune. MJM 705, 772, 1064.

KALMIA L.

K. angustifolia L. Sheeplaurel

Rare; wet swales in backdune, just east of Stage Island Pool. MJM 987.

LYONIA Nutt.

L. ligustrina (L.) DC. Maleberry

Occasional; shrub thickets in backdune throughout the Dune Natural Area. Inconspicuous except in fruit. MJM 983.

VACCINIUM L.

V. angustifolium Ait. Low Sweet Blueberry

Occasional; open field south of parking lot 5 (Hellcat Swamp). MJM 640.

V. angustifolium X V. corymbosum

Occasional; edge of small pools in the Dune Natural Area. MJM 594, 1064.

V. corymbosum L. Highbush Blueberry

Common; wet swales and shrub thickets in backdune. MJM 266, 1069.

V. macrocarpon Ait. Cranberry

Locally abundant; forming dense mats in wet depressions between dunes. MJM 420, 652.

V. pallidum Ait. Lowbush Blueberry

(= V. vacillans Torr. in Fernald, 1950.)

Occasional; along road south of Hellcat Swamp and along the Pines Nature Trail. MJM 520, 704. (Taxonomy follows Vander Kloet, 1978.)

PRIMULACEAE (Primrose Family)

ANAGALLIS L.

A. arvensis L. Scarlet Pimpernel

Common; eroding cliffs of Bar Head. MJM and Storks 1152.

GLAUX L.

G. maritima L. Sea Milkwort

var. obtusifolia Fern.

Frequent; upper borders of salt marshes and gravelly

shores. MJM 480, 1186, 1346.

LYSIMACHIA L.

L. ciliata L. Loosestrife

Occasional; locally abundant along rich slopes of Grape Island. MJM 754.

L. quadrifolia L. Whorled Loosestrife

Occasional; thicket on west side of road just north of North Pool. MJM 1063.

L. terrestris (L.) BSP. Swamp-candles

Common; wet areas, edge of field at Stage Island and along road. MJM 527, 613, 661.

TRIENTALIS L.

T. borealis Raf. Star Flower

Occasional; under shrub thickets and Pitch Pines. MJM 265, 445, 1065.

PLUMBAGINACEAE (Leadwort Family)

LIMONIUM Mill.

L. carolinianum (Walt.) Britt. Sea Lavender

(= L. nashii in Fernald, 1950.)

Frequent; upper borders of salt marsh. MJM 691. (Taxonomy follows Luteyn, 1976.)

STYRACACEAE (Storax Family)

STYRAX L.

S. americana Lam. Mock-orange

Cultivated; persistent on Grape Island. MJM 1130.

OLEACEAE (Olive Family)

FORSYTHIA Vahl

F. viridissima Lindl. Forsythia

Cultivated; persistent on small hill just west of parking lot 1. MJM 484, 1001.

FRAXINUS L.

F. pennsylvanica Marsh. Red Ash

Rare; one tree in dune hollow, in Dune Natural Area east of North Pool. MJM 1294.

var. subintegerrima (Vahl) Fern. Green Ash

Occasional; Grape Island. MJM 743, 1126.

SYRINGA L.

S. vulgaris L. Lilac

Cultivated; persistent on Grape Island. MJM 756.

GENTIANACEAE (Gentian Family)

CENTAURIUM Hill

C. umbellatum Gilib. Centaury

Rare; southern end of island. Harry Ahles personal communication.

APOCYNACEAE (Dogbane Family)

APOCYNUM L.

A. androsaemifolium L. Spreading Dogbane

Occasional; along roadsides. MJM 523.

A. sibiricum Jacq.

Occasional; on dike surrounding South Pool and along roadsides. MJM 510.

ASCLEPIADACEAE (Milkweed Family)

ASCLEPIAS L.

A. amplexicaulis Sm. Milkweed

Rare; a few plants in field south of parking lot 5 (Hellcat Swamp). MJM 1258.

A. syriaca L. Common Milkweed

Common; fields, waste places, and along roadsides. MJM 472, 1176, 1200.

CONVOLVULACEAE (Convolvulus Family)

CONVOLVULUS L.

C. arvensis L. Field Bindweed

Common; meadow on Stage Island. MJM 534.

C. sepium L. Hedge Bindweed

forma malachophyllus Fern.

Occasional; shrub thickets, open fields, and upper edge of salt marsh. MJM 370, 399.

CUSCUTA L.

C. gronovii Willd. Dodder

Occasional; wet areas and along upper edge of salt marsh. Parasitic on Solidago sempervirens and Lythrum salicaria. MJM 1241, 1282.

VERBENACEAE (Vervain Family)

VERBENA L.

V. hastata L. Blue Vervain

Rare; wet lower slope of Cross Farm Hill bordering salt marsh. MJM 731.

LABIATAE (Mint Family)

GALEOPSIS L.

G. tetrahit L. Hemp-nettle

var. bifida (Boenn.) Lej. and Court.

Common; shrub thickets throughout backdune. MJM 453, 683, 734.

GLECHOMA L.

G. hederacea L. Gill-over-the-ground

Occasional; dense stand on mound just west of parking lot 1. MJM 485, 1002.

LEONURUS L.

L. cardiaca L. Common Motherwort

Occasional; under Black Gum in Hellcat Swamp, west side of road. MJM 435.

LYCOPUS L.

L. americanus Muhl. Water-horehound

Common; wet areas and along edge of North and South Pool. MJM 516, 621, 708.

L. asper Greene

Occasional; goose field adjacent to North Pool. MJM 614.

L. uniflorus Michx.

Rare; dune hollows. White 313 [NEBC].

L. virginicus L.

Rare; wet ground along path to tower at parking lot 7. MJM 815.

NEPETA L.

N. cataria L. Catnip

Occasional; Cross Farm Hill and Stage Island. MJM 724, 1211.

PRUNELLA L.

P. vulgaris L. Heal-all

var. lanceolata (Bart.) Fern.

Occasional; along road and on Cross Farm Hill. MJM 462, 1233.

SCUTELLARIA L.

S. epilobiifolia A. Hamilton Common Scullcap

Common; moist areas throughout island, particularly around Stage Island Pool and on the lower slopes of Cross Farm Hill. MJM 505, 1183, 1196.

TEUCRIUM L.

T. canadense L. Wood-Sage

Common; under cherry thicket in backdune, along edge of road, and on lower slopes of Stage Island. MJM 431, 1289, 1344.

TRICHOSTEMA L.

T. dichotomum L. Bluecurls

Occasional; in field adjacent to Subheadquarters. MJM 1305.

SOLANACEAE (Nightshade Family)

DATURA L.

D. innoxia Mill. Jimsonweed

Occasional; waste places, north end of island. Harris, 1975.

D. stramonium L.

var. tatula (L.) Torr.

Occasional; waste places and disturbed areas. Harris, 1975.

SOLANUM L.

S. dulcamara L. Nightshade

Common; shrub thickets and open ground throughout island. MJM 331.

S.nigrum L. Black Nightshade

Occasional; shrub thickets in Hellcat Swamp. MJM 769.

SCROPHULARIACEAE (Figwort Family)

GERARDIA L.

G. maritima Raf. Gerardia

Common; along upper borders of salt marsh. MJM 822, 1349.

G. paupercula (Gray) Britt.

Common; along borders of field south of Subheadquarters. MJM 1322.

G. purpurea L.

Rare; border of salt marsh, Newbury. Single collection. Mackintosh s.n., 13 Sept 1924 [NEBC].

LINARIA Mill.

L. canadensis (L.) Dumont Old-Field-Toadflax

Common; open fields and shrub thickets. MJM 311, 765.

L. vulgaris Hill Butter-and-Eggs

Occasional; roadsides, disturbed areas, and vacant lots. MJM 466, 1177.

LINDERNIA All.

L. dubia (L.) Pennell False Pimpernel

Rare; banks of small pool just south of Subheadquarters. MJM 1335.

VERBASCUM L.

V. thapsus L. Common Mullein

Common; along roadsides and waste places. MJM 470.

VERONICA L.

V. officinalis L. Common Speedwell

Occasional; thickets. Ahles 77569 [MASS].

PLANTAGINACEAE (Plantain Family)

PLANTAGO L.

P. aristata Michx. Bracted Plantain

Occasional; disturbed areas, particularly abundant on dike surrounding North Pool. MJM 500.

P. lanceolata L. English Plantain

Occasional; along dikes surrounding North and South Pools and in meadow on Stage Island. MJM 679, 1040.

P. major L. Common Plantain

var. major

Occasional. St. John and White 574 [NEBC].

var. scopulorum Fries and Broberg

Occasional; along edge of road bordering salt marsh. MJM 490.

P. oliganthos R. and S. Seaside Plantain

Common; upper borders of salt marsh. MJM 649, 1350.

RUBIACEAE (Madder Family)

CEPHALANTHUS L.

C. occidentalis L. Buttonbush

Occasional; Hellcat Swamp. MJM 548.

HOUSTONIA L.

H. caerulea L. Bluets

Occasional; burned area of the Dune Natural Area and uplands at southern tip of island. MJM 318, 1052.

GALIUM L.

G. aparine L. Cleavers

Frequent; throughout island, along roadsides and in wet swales. MJM 304, 1055, 1116.

G. palustre L.

Occasional; Hellcat swamp. Harris, McGregor and Schweinfurth 12719 [NEBC].

G. tinctorium L. Bedstraw

Occasional; shrub thickets at southern end of Stage Island Pool by tower. MJM 657.

G. triflorum Michx. Sweet-scented Bedstraw

Occasional; thickets. Ahles 77563 [MASS].

CAPRIFOLIACEAE (Honeysuckle Family)

LONICERA L.

L. morrowi Gray Honeysuckle

Abundant; forming dense thickets throughout backdune and on Grape Island. MJM 319, 1020, 1024.

SAMBUCUS L.

S. canadensis L. Common Elderberry

Occasional; along roadsides and in clearings. MJM 437, 1051.

VIBURNUM L.

V. cassinoides L. — Wild Raisin

Occasional; wet swales and shrub thicket on Grape Island. MJM 1084, 1125.

V. opulus L. — Guelder-Rose

Rare; Bar Head. Ahles 77480 [MASS].

V. recognitum Fern. — Arrow-wood

Abundant; wet swales and shrub thickets throughout island. MJM 270, 796, 1194.

COMPOSITAE (Composite Family)

ACHILLEA L.

A. lanulosa Nutt. — Yarrow

Common; sandy soil along roads and in meadows. MJM 293, 1204.

A. millefolium L. — Common Yarrow

Occasional; along edge of parking lot 1. MJM 472.

AMBROSIA L.

A. artemisiifolia L. — Common Ragweed

Common; along roadsides and in disturbed areas. MJM 848, 1205.

ANTENNARIA Gaertn.

A. plantaginifolia (L.) Hook. — Everlasting

Occasional; open ground and disturbed areas. Harris 12074 [NEBC].

ARCTIUM L.

A. minus (Hill) Bernh. Common Burdock

Occasional; disturbed areas, roadsides, and on slopes of Grape Island. MJM 733, 1128.

ARTEMISIA L.

A. caudata Michx. Wormwood

Common; open sand and along roadsides. MJM 855, 783, 1356.

A. stelleriana Bess. Dusty Miller

Common; open sands, particularly on the foredune. MJM 388, 666, 1274.

A. vulgaris L. Common Mugwort

Frequent; along roadsides and in disturbed areas. MJM 852, 810, 1339.

ASTER L.

A. ericoides L. Aster

Occasional; open sands, southesrn end of island. Harris 12447 [NEBC].

A. linariifolius L.

var. linariifolius

Occasional; open sands in backdune around parking lot 8. MJM 853, 868.

forma leucoctis Benke

Rare; white flowered. Single collection. Snyder s.n., 16 Sept. 1951 [PM].

A. novi-belgii L. New York Aster

Common; open sands and along roadsides. MJM 462, 588,

1362.

A. subulatus Michx. Salt Marsh Aster

Occasional; salt marshes and on edge of South Pool. MJM 907, 1329.

A. undulatus L.

Occasional. Harris 12554 [NEBC].

CENTAUREA L.

C. nigra L. Knapweed

Common; disturbed areas and along roadsides. MJM 525, 1148, 1163.

BIDENS L.

B. cernua L. Stick-tight

Occasional; shores. Harris 12391 [NEBC].

B. connata Muhl. Beggar-ticks

var. connata

Occasional; shores of North Pool. MJM 865.

var. petiolata (Nutt.) Farw.

Occasional; shores of North Pool. MJM 871.

B. coronata (L.) Britt. Beggar-ticks

var. brachyodonta Fern.

Rare; moist ground. Hodgdon 15399 [NHA].

B. frondosa L.

Common; moist areas and along beach below Bar Head. MJM 1312.

CHRYSANTHEMUM L.

C. leucanthemum L. White Daisy

var. pinnatifidum Lecoq and Lamotte

Common; disturbed areas and along roadsides. MJM 292.

CICHORIUM L.

C. intybus L. Chicory

Common; disturbed areas and roadsides at northern end of island. MJM 918.

CIRSIUM Mill.

C. arvense (L.) Scop. Canada Thistle

Common; roadsides and in field on Stage Island. MJM 656, 1181.

C. horridulum Michx. Yellow Thistle

Occasional; Bar Head. Harris, McGregor, and Schweinfurth 12663 [NEBC].

C. pumilum (Nutt.) Spreng. Pasture Thistle

Occasional; fields and open areas, southern end of island. Harris, McGregor and Schweinfurth 12420 [NEBC].

C. vulgare (Savi) Tenore

Occasional. Harris, McGregor and Schweinfurth 12644 [NEBC].

ERECHTITES Raf.

E. hieracifolia (L.) Raf. Fireweed

Common; shores of North Pool. MJM 824, 834.

ERIGERON L.

E. canadensis L. — Horseweed

Common; disturbed areas and roadsides. MJM 846, 1317, 1326.

E. strigosus Muhl. — Daisy Fleabane

Common; along roadsides and in open fields. MJM 475, 655, 1199.

EUPATORIUM L.

E. dubium Willd. — Joe-Pye Weed

Rare; few plants along road to cottages on Sandy Point, in State Park. MJM 1223.

E. perfoliatum L. — Boneset

Occasional; shrub thicket bordering South Pool. MJM 672.

GNAPHALIUM L.

G. obtusifolium L. — Catfoot

Common; open sand and fields. MJM 842, 1303, 1304.

G. uliginosum L. — Low Catfoot

Common; disturbed areas and along roadsides. MJM 784, 1279, 1336.

HELIANTHUS L.

H. annuus L. — Common Sunflower

Occasional; roadsides and waste places. Harris 12530 [NEBC].

HIERACIUM L.

H. aurantiacum L. Orange Hawkweed

Occasional; open field south of Hellcat Swamp. *Ahles 77598* [MASS].

H. canadense Michx. Hawkweed

var. *fasciculatum* (Pursh) Fern.

Occasional; edge of shrub thickets, Hellcat Swamp. *MJM 835*.

H. flagellare Willd.

Occasional; along roadsides and in goose field adjacent to North Pool. *MJM 303*, *1083*.

H. florentinum All. King Devil

Occasional; disturbed areas and along road to Stage Island. *MJM 1032*.

H. sabaudum L.

Common; along roadsides and waste places. *MJM 1337*.

IVA L.

I. frutescens L. Marsh-elder

var. *oraria* (Bartlett) Fern. and Grisc.

Common; upper edges of marsh, particularly north of Refuge. *MJM 917*, *1089*.

KRIGIA Schreb.

K. virginica (L.) Willd. Dwarf Dandelion

Occasional; disturbed areas and fields. *MJM 352*.

LACTUCA L.

L. biennis (Moench) Fern. Wild Lettuce

Occasional; shrub thickets in backdune. MJM 829.

L. canadensis L. Wild Lettuce

Occasional; shrub thickets in backdune. MJM 805.

LEONTODON L.

L. autumnalis L. Fall Dandelion

Occasional; disturbed areas and open fields. MJM 617, 773.

MATRICARIA L.

M. matricarioides (Less.) Porter Pineapple-Weed

Occasional; parking lots and disturbed areas. MJM 401.

PLUCHEA Cass.

P. purpurascens (Sw.) DC. Salt Marsh Fleabane

var. *succulenta* Fern.

Occasional; salt marshes and border of South Pool. MJM 906.

RUDBECKIA L.

R. hirta L. Black-eyed Susan

var. *pulcherrima* Farwell

(= *R. serotina* Nutt. in Fernald, 1950.)

Common; roadsides and on Cross Farm Hill. MJM 643, 718. (Taxonomy follows Perdue, 1957.)

SENECIO L.

S. jacobaea L. Stinking Willie

Rare; one colony in shrub thicket just south of parking lot 7. MJM 658, 812.

SOLIDAGO L.

X S. asperula Desf. Goldenrod

(A hybrid between S. sempervirens and S. rugosa.)

Occasional; southern end of island. Harris 12429 [NEBC].

S. canadensis L.

Common; open thickets and along roadsides. MJM 618, 813, 1288.

S. gigantea Ait.

Occasional; thickets at southern end of island. Ahles 77550 [MASS].

S. gigantea X S. sempervirens

Occasional; thickets at southern end of island. Ahles 77565 [MASS].

S. graminifolia (L.) Salisb.

var. nuttallii (Greene) Fern.

Frequent; along roadsides and in disturbed areas. MJM 696, 1292, 1336.

S. juncea Ait.

Common; clearings. MJM 626.

S. rugosa Ait.

Common; shrub thickets and clearings. MJM 1357.

S. sempervirens L. Seaside Goldenrod

Frequent; open sands throughout island. MJM 811, 847.

SONCHUS L.

S. arvensis L. Field Sow-Thistle

Occasional; edge of meadow bordering salt marsh, Cross Farm Hill. MJM 723.

S. asper (L.) Hill Spiny-leaved Sow-Thistle

Occasional; field on Stage Island. MJM 1185.

TANACETUM L.

T. vulgare L. Common Tansy

Occasional; disturbed areas and open sands in backdune. MJM 694, 1161.

TARAXACUM Zinn

T. officinale Weber Common Dandelion

Occasional; waste places and open ground. MJM 256.

TRAGOPOGON L.

T. dubius Scop. Goat's Beard

(= T. major Jacq. in Fernald, 1950.)

Rare; disturbed area in field on Stage Island which was once the site of an Inn. MJM 1201. New County Record. (Taxonomy follows Gleason and Cronquist, 1963.)

T. pratensis L. Goat's Beard

Rare; small patch in west corner of field on Cross Farm Hill. MJM 1239.

XANTHIUM L.

X. echinatum Murr. Sea-burdock

Occasional; along beach and among flotson in breaks in the foredune ridge. MJM 560.

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